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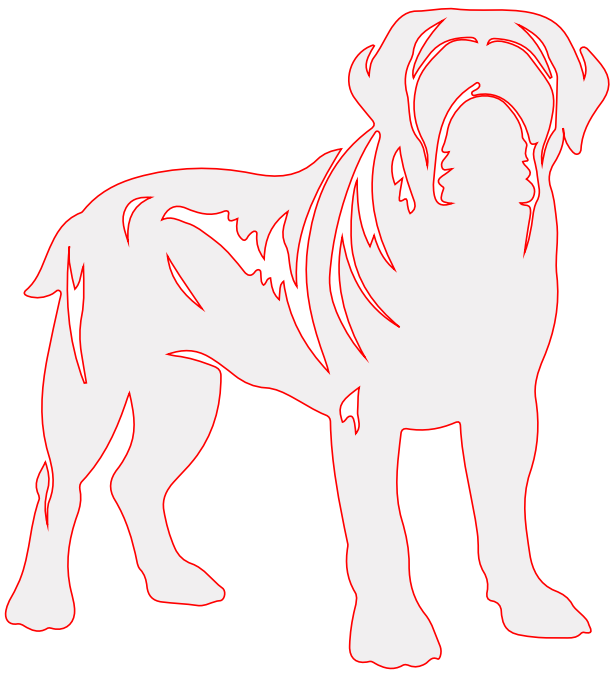

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A MODERN LOOK AT AN ANCIENT BREED: CLINICAL REFLECTIONS ON THE NEAPOLITAN MASTIFF

Dear students, veterinarians, professors, and animal lovers,

It is with genuine enthusiasm—and equal humility—that I present this work dedicated to the Neapolitan Mastiff. This text is not the product of a specialist's career-long expertise, but rather the sincere effort of a final-year veterinary student who has chosen to explore one of the most iconic, unique, and historically rich breeds in the canine world. My intention is not to teach, but to contribute: to offer a clear, accessible, and clinically grounded overview that may support those who, like me, are still building their knowledge and refining their understanding of veterinary medicine.

Furthermore, this project is a way for me to honor and demonstrate my origins and the profound connection to the territory from which this magnificent breed hails.

This guide collects insights from four major areas—ophthalmology, orthopaedics, nutrition, and dermatology—each of which represents a fundamental pillar in the health of the Neapolitan Mastiff. Through a combination of scientific literature, clinical reasoning, and practical observations, the goal is to provide a coherent introduction to the breed's most relevant medical considerations, highlighting both its strengths and its predispositions.

More than a technical manual, this text aims to be a companion for students who are approaching their first clinical experiences, a reference for enthusiasts who wish to better understand this extraordinary dog, and a respectful homage to the professionals who dedicate their lives to veterinary science. Above all, it is a celebration of learning—of the curiosity that drives our studies, the passion that fuels our work, and the responsibility we share toward the animals entrusted to us.

I hope these pages serve as a helpful starting point, an encouragement to explore further, and a reminder that every veterinarian begins as a student driven by questions and guided by love for animals.

Thank you for reading, and for joining me on this journey into the remarkable world of the Neapolitan Mastiff.

Giovanni Rocca

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CHAPTER 1

Origins and Historical Development of the Neapolitan Mastiff

Introduction

The Neapolitan Mastiff is a dog breed characterized by a remarkable body mass and a highly recognizable external morphology, which has drawn the attention of breeders, historians, and researchers. Developed in southern Italy, particularly in the Campania region, this breed has evolved within a historical framework that can be traced to the classical era. Initially selected for defensive purposes, the Neapolitan Mastiff proved to be an effective guardian due to its strong protective instincts and reliable temperament. In contemporary settings, the breed is appreciated not only for its historical background but also for its behavioral traits and physical uniqueness. The objective of this paper is to analyze the origin, evolution, and current status of the Neapolitan Mastiff, highlighting the factors that have contributed to its long-standing presence and relevance in modern society.

The Origins of the Neapolitan Mastif

The Neapolitan Mastiff, or Mastino Napoletano, is a breed with a storied history that dates back to ancient times. This majestic breed is believed to have originated from the large war dogs used by the Roman legions, known for their strength and loyalty. These dogs were not only used in battle but also served as guardians of estates and livestock

Historical Background

The origins of the Neapolitan Mastiff can be traced back to the Roman Empire, where they were known as the "big dog of the little man". These dogs were highly valued for their protective instincts and formidable presence.It is the heir of the Roman Molossus, the guardian dog of the legionaries' camp, a fighter in the circus with wild beasts, and a hunter of large game. It is the descendant of the war molossers of the Sumerian and Mesopotamian populations, and of the Assyrians of Alexander the Great. In turn, they can be traced back to the Tibetan Mastiff. It is difficult to follow its evolution step by step. The first written records referring to the breed date back to Roman times and can be found in the citations of the heavy Canis Pugnax, the ancient Roman molossus used in arenas against wild beasts and for guarding country villas. A lighter variant was used, but only exceptionally, by the legions as a war dog, as the Romans generally did not use them in battle but for guarding military posts. Regarding their use in battle, it is known only of the Canis Pugnax used to flush out rebels in Sardinia in the 3rd century BC.

The Canis Pugnax was a remarkably versatile and highly regarded dog, admired not only for its considerable strength but also for its intelligence, bravery, and adaptability. In its lighter forms, these dogs were widely used for a variety of practical purposes, including hunting large game, managing cattle, and offering personal protection. Hunters prized them for their ability to pursue and confront wild animals with accuracy and courage, while herders valued their natural understanding of livestock, their skill in directing herds, and their capacity to act independently when necessary. The combination of strength, agility, and sharp perception made the breed an essential partner in rural life, capable of handling challenging tasks across difficult terrain.

Beyond these practical roles, the Canis Pugnax held a significant place in the collective imagination. From ancient times through the Middle Ages, mastiffs were involved in arena contests and ludi venatorii, where their courage, strength, and combative instincts were displayed for audiences. Although such spectacles declined over time, Italian molossers continued to perform essential duties for herders, carters, hunters, and even brigands. Their presence in daily life was also celebrated in the 18th-century artworks of Bartolomeo Pinelli, which portray these dogs not only as working companions but also as symbols of loyalty, power, and courage.

During the period of brigandage in southern Italy, the Neapolitan Mastiff—often called the Cane 'e presa—played a particularly dramatic role. Alongside the Cane Corso, frequently regarded as a close relative of the mastiff, these dogs were used by brigands to guard hideouts, protect their human associates, and intimidate enemies during conflicts with the Savoy army. Their size, vigilance, and fearless nature made them invaluable in both defensive and offensive operations. Over the centuries, the Canis Pugnax transcended its role as a working dog, becoming a cultural symbol that represented resilience, loyalty, and the deep bond between humans and animals. Today, its legacy survives in art, literature, and historical accounts, preserving a history of courage, service, and versatility that few breeds have matched.

After the defeat of Gaeta, the pure mastiff almost completely disappeared, with only a few specimens remaining, giving rise to the farm mastiff. Lost track of for many years, in the mid-20th century, mainly bred in the Neapolitan and Avellino countryside, thanks to Piero Scanziani, the mastiff was rediscovered by official cynology in a version still "heavier" than the ancient one. It is worth quoting the words with which Scanziani recalls his encounter with Guaglione, the progenitor of our mastiff's genealogical books:

"I recognized him instantly: he was one of the hundred that Paulus Aemilius the Macedonian had brought to Rome in his triumph. He was the great dog of Epirus, son of the Assyrians, grandson of the Tibetans, he was the Molossus. Guaglione, from the height of his centuries, stared at me unperturbed, eyes neither hostile nor kind, a gaze that neither gives nor asks: he gazes. He gazed at Arno, held on my leash. I retreated, remembering D'Annunzio: a molossus ready to bite without barking. Guaglione became a patriarch."

Guaglione *with the traditional badger-fur collar - source: Modern molosser magazine*

Initially, the names "cane 'e presa", "Italian molossus", "mastiff dog", "Cane Corso" were maintained, then around the mid-1960s, the name "Neapolitan Mastiff" was established.The breed was later perfected by breeder Mario Querci, with the historic breeding kennel "di Ponzano", who managed to select a type of dog that reflects today's Mastiff.

Piero Scanziani worked tirelessly to have the breed officially recognized and was responsible for developing its first formal Standard, which gained approval in 1949. This large molosser excels as a guardian of both property and people, possessing a powerful, majestic, and imposing physique while displaying no fear. Its temperament, however, is not aggressive without cause; the Neapolitan Mastiff is calm, thoughtful, and well-balanced. It is intelligent, trainable, highly reliable, and straightforward, with an attack that can be astonishingly swift when necessary. Its body is heavy and rectangular, moving with a fluid, almost feline grace, supported by loose, strong limbs. The skin is abundant and pendulous, and the head is striking, covered with wrinkles and folds that give the breed its distinctive expression. Over the centuries, the Neapolitan Mastiff gradually developed throughout the Campania region, particularly in the areas surrounding Naples.

"Ferdinando Dei Cani" and the Neapolitan Mastiffs

The phrase "Ferdinando dê cane" referred to Ferdinand IV and reflects the king's well-known affection for dogs. Even today, this expression is used to describe someone with a strong enthusiasm for these animals. At the Royal Palace of Caserta, within the park near the Fountain of Diana and Actaeon, the figures of Malacera and Diana appear as part of a hunting dog ensemble. In this artistic composition, Tommaso Solari, working under a royal commission, portrayed nine distinct Neapolitan Mastiffs. This depiction highlights the Bourbon family's particular interest in molosser dogs, which were later also employed by brigands for protection and defense throughout the region.

The fountain of Diana and Actaeon

Official Research and Recognition

The modern history of the breed began in the mid-20th century. In 1947, Piero Scanziani, an Italian journalist and passionate dog enthusiast, played a key role in establishing a formal standard for the Neapolitan Mastiff. He encountered the breed at a dog show in Naples and was immediately struck by its distinctive appearance and temperament. Thanks to his dedication, the breed received official recognition from the Ente Nazionale della Cinofilia Italiana (ENCI) in 1949. The Fédération Cynologique Internationale (FCI) followed by granting the Neapolitan Mastiff full international acceptance in 1956.

Piero Scanziani with his wife, *Magi Scanziani*
Source: www.pangea.news

FCI Breed Standards

The FCI breed standards for the Neapolitan Mastiff are precise and detailed. According to FCI Standard No. 197, the breed belongs to Group 2: Pinscher and Schnauzer, Molossoid breeds, and Swiss Mountain and Cattle Dogs. The dog is notable for its large frame, abundant loose skin, and characteristic wrinkles. The body length should be about 15% longer than the height at the withers. The head is broad and short, with parallel skull and muzzle lines, deep-set eyes giving a serious expression, and small triangular ears. The muzzle is square and strong, with a prominent dewlap. The body is compact and muscular, with a wide, deep chest, well-sprung ribs, straight back, slightly sloping croup, and a tail thick at the base, tapering and carried level or slightly curved. Limbs are strong, straight, and heavily boned; movement is powerful and rolling, yet shows some feline fluidity.
The coat is short, dense, and coarse. Accepted colors include grey, leaden grey, black, brown, mahogany, and fawn, with small white markings on the chest and feet tolerated.

Males typically stand 65–75 cm at the withers and weigh between 60 and 70 kg, while females measure 60–68 cm and weigh 50–60 kg. The breed's temperament is calm, balanced, and protective. Bred traditionally as a guardian, the Neapolitan Mastiff is loyal, courageous, and highly vigilant, never aggressive without cause but extremely quick when defending. Its character combines remarkable strength, historical roots tracing back to the Roman Molossus, and a dignified, imposing presence, making it both a functional guardian and a cultural icon.

Fédération Cynologique Internationale

Piero Scanziani with his beloved dogs
Source:www.difossombrone.it

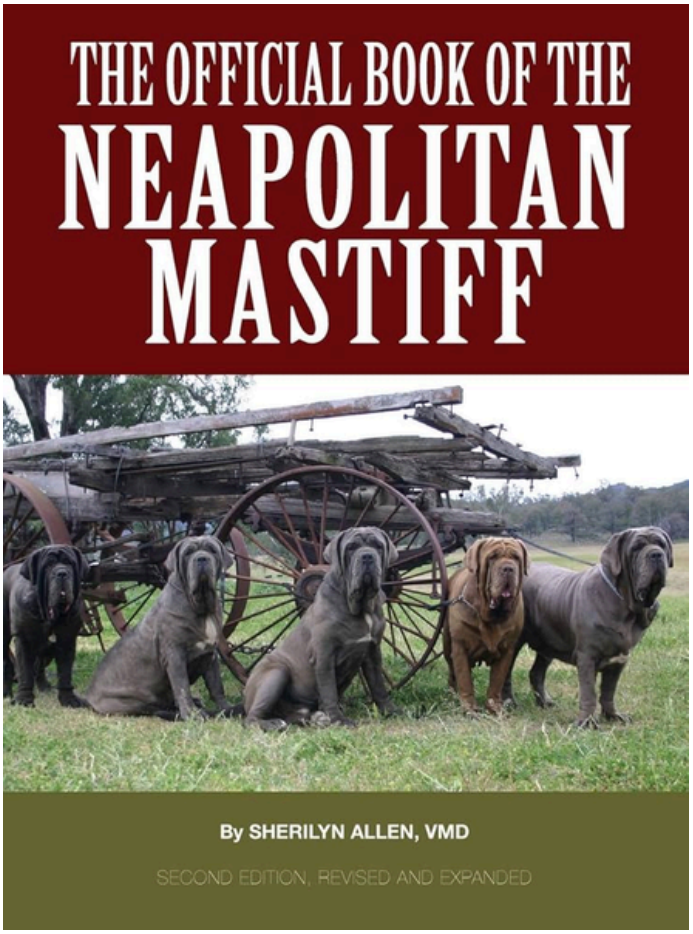
Neapolitan Mastiff Health

As with many large and historically ancient breeds, the Neapolitan Mastiff can develop a variety of inherited health issues that demand close attention. Among the most significant are ocular conditions, including entropion, ectropion, and cataracts, which may affect vision and create persistent discomfort if left untreated. Routine eye examinations are therefore vital to safeguard each dog's well-being and to limit the inheritance of these disorders in future generations.

Joint and skeletal issues are another primary concern, particularly hip and elbow dysplasia. These developmental problems are frequently observed in giant breeds and can lead to pain, difficulty walking, and progressive arthritis, greatly impacting mobility and quality of life. Early evaluation using radiographs, combined with careful breeding choices, is essential to reduce the prevalence of these conditions. Breeders should prioritize individuals with sound joints and avoid mating dogs with serious dysplasia, due to the condition's strong hereditary component.

The Neapolitan Mastiff is also prone to dermatological problems. Its distinctive loose skin, with deep folds, can trap moisture and bacteria, predisposing the dog to repeated skin infections such as dermatitis, pyoderma, or fungal diseases. These conditions often require professional veterinary attention and ongoing care. Preventive steps—such as cleaning the folds regularly, maintaining proper hygiene, and providing a diet that supports skin health—are critical for minimizing these risks.

Taken together, these health concerns highlight the importance of consistent veterinary oversight in both the care and breeding of the Neapolitan Mastiff. Regular health screenings, thoughtful selection of breeding dogs, and attentive daily care are fundamental to ensuring that the breed's imposing appearance is matched by sustained health and vitality over the years.



"The Official Book of the Neapolitan Mastiff" is a comprehensive guide dedicated to one of the most iconic and ancient Italian breeds. This authoritative volume covers the breed's history, origins, and cultural significance, tracing its lineage from early molossoid dogs to the modern Neapolitan Mastiff. It provides detailed descriptions of breed standards, including morphology, coat characteristics, and distinctive features such as its massive head, loose skin, and expressive wrinkles. Beyond conformation, the book explores temperament, behavior, and the unique personality traits that make the Neapolitan Mastiff a loyal and protective companion. Practical sections address health, nutrition, grooming, and preventive care, offering breeders, owners, and enthusiasts essential guidance for responsible management and preservation of the breed. Richly illustrated with photographs, diagrams, and historical references, this book serves as both a reference and a celebration of the Neapolitan Mastiff, emphasizing its importance as a living symbol of Italian canine heritage.

CHAPTER 2

Ocular Health in the Neapolitan Mastiff: Clinical Overview

Introduction

The ECVO (European College of Veterinary Ophthalmologists) reports that the Neapolitan Mastiff is susceptible to several inherited eye disorders, many of which are related to the breed's unique facial structure and abundant skin folds. These conditions can seriously affect eye health and vision, making systematic ophthalmic screening and careful breeding practices essential. The most commonly encountered issues include:

- Macroblepharon: An unusually wide eyelid opening, frequently associated with ectropion, resulting in a "diamond-shaped" palpebral fissure. This overexposure increases the risk of chronic irritation, dryness, and secondary eye infections.
- Entropion: Inward rolling of the eyelid margin, causing eyelashes or surrounding hair to contact the cornea. This produces pain, tearing, and repeated inflammation, sometimes leading to corneal scarring. Surgical correction is often necessary, tailored to the heavy eyelids of giant breeds.
- Ectropion (common in this breed): Outward turning of the lower eyelid exposes the conjunctiva, which can result in persistent conjunctivitis and eye irritation. In Neapolitan Mastiffs, this is largely a constitutional trait due to excess skin and lax eyelids, though severe cases may require surgery.
- Keratoconjunctivitis Sicca (KCS, "dry eye"): Reduced tear production causes discomfort, redness, thick ocular discharge, and corneal ulcers. Often immune-mediated, KCS requires lifelong management using tear supplements or immunomodulatory treatments.
- Cherry Eye (prolapse of the third eyelid gland): Congenital weakness in the connective tissue of the nictitating membrane gland causes it to protrude as a red, swollen mass at the medial canthus. Surgical repositioning is the preferred therapy.
- Retinal Dysplasia: A congenital defect of the retina, potentially due to genetic factors or in-utero trauma. It can lead to partial or complete blindness, with ophthalmoscopic signs such as retinal folds, detachment, or hemorrhage. No effective treatment exists, and affected dogs should not be bred.
- Dermoid: An abnormal patch of skin containing hair follicles, located on the conjunctiva, cornea, or eyelid. The hairs cause irritation and secondary corneal damage. Surgical removal is the definitive solution.

The ACVO book on ocular problems in dogs is widely regarded as one of the most practical and reliable references for anyone working in veterinary ophthalmology. Although it is a specialist text, it is written with a strong clinical focus, making it useful not only for board-certified ophthalmologists but also for general practitioners, interns, and students who want to better understand canine eye diseases.
The book is organized in a clear, logical structure that mirrors the way clinicians approach the eye: starting with the external structures, such as eyelids and conjunctiva, and moving inward through the cornea, anterior chamber, lens, retina, and optic nerve. Each chapter combines essential anatomy with straightforward descriptions of clinical signs, diagnostic methods, and treatment principles. This helps the reader immediately apply the concepts to real-world cases.
One of the greatest strengths of the ACVO text is that it reflects the standards and recommendations of the American College of Veterinary Ophthalmologists. Rather than simply listing diseases, it guides the reader through a consistent diagnostic process, explaining how to perform a complete eye examination, which tests to choose, and how to interpret common patterns such as red eye, cloudy eye, or sudden vision loss.
The book also includes numerous photographs, illustrations, and clinical examples that support fast recognition of ocular conditions. These visuals make it easier to compare cases and confirm suspicions during routine examinations, turning the book into a practical, everyday tool in the clinic.
Overall, the ACVO book is valued because it combines scientific accuracy with clarity and clinical relevance. It serves both as a study resource and as a quick-reference guide, offering accessible, trustworthy information that helps veterinarians diagnose and manage canine ocular problems with confidence. For anyone involved in veterinary ophthalmology, it remains an indispensable companion.

These conditions underscore the complexity of ocular disease in the Neapolitan Mastiff. Regular eye examinations, early diagnosis, and careful breeding selection are essential to reduce their incidence and protect overall breed welfare.

Macroblepharon

Macroblepharon is a conformational eyelid disorder characterized by an excessive horizontal length of the palpebral fissure. Among canine breeds, the Neapolitan Mastiff is one of the most predisposed due to its extreme brachycephalic–molossoid morphology, heavy facial folds, and markedly lax periocular skin. Although macroblepharon can be encountered in several large and giant breeds, in the Neapolitan Mastiff it frequently appears as part of a more complex periocular syndrome, coexisting with entropion, ectropion, and functional lagophthalmos. In this breed, macroblepharon often contributes to the development of the so-called "diamond eye" configuration — a term used in veterinary ophthalmology to describe the diamond-shaped palpebral fissure produced by the combined effects of excessive eyelid length, lateral ectropion, medial entropion, and generalized eyelid laxity. The distortion of all four eyelid margins alters the normal almond-shaped aperture, creating an irregular rhomboid outline that further destabilizes the tear film and increases corneal exposure.
The disorder is usually congenital, bilaterally symmetrical, and becomes clinically evident early in life.

Pathophysiology

The key pathophysiological mechanism derives from the breed's characteristic redundant and pendulous skin, which increases the mechanical load on the upper and especially the lower eyelids. This traction enlarges the palpebral fissure beyond normal limits and reduces the natural apposition of the eyelid margins against the corneal surface. In addition, the canthi—particularly the lateral canthus —tend to exhibit poor fibrous support and weak lateral canthal tendon tone, allowing the eyelids to drift outward. The result is a combination of:

- excessive horizontal eyelid length,
- outward rolling of the eyelid (secondary ectropion),
- decreased ability to close the eyes completely (lagophthalmos),
- and compromised blinking efficiency.

These abnormalities destabilize the tear film, causing chronic corneal exposure that leads to keratitis, recurrent conjunctivitis, ulceration, and, over time, corneal scarring with reduced vision.

Clinical Presentation

Affected Neapolitan Mastiffs typically show a conspicuously elongated palpebral fissure, often measuring 30–40 mm or more. The lower eyelids are frequently everted, revealing conjunctival tissue and allowing excessive scleral exposure. Owners commonly report chronic ocular discharge, recurrent conjunctivitis, and a "tired" or droopy facial expression.
On ophthalmic examination, clinicians may observe:

- conjunctival hyperemia and chemosis,
- excessive exposure of the ventral bulbar conjunctiva,
- unstable or incomplete blinking,
- low tear film stability (short tear breakup time),
- pigmentary keratitis or peripheral corneal vascularization,
- ulcers localized to the central or ventral cornea,
- and, in chronic cases, a combination of entropion–ectropion ("diamond eye") deformity.

Although Schirmer tear test values are often within or slightly above normal, the tears are distributed poorly, resulting in evaporative tear-film insufficiency rather than classic aqueous tear deficiency.

Diagnosis

Diagnosis is primarily clinical, based on eyelid morphology and functional assessment. Key diagnostic steps include:

- Evaluation of eyelid length and position, documenting the excessive palpebral fissure.
- Assessment of blink completeness and manual induction of eyelid closure to verify lagophthalmos.
- Measurement of tear film function, including Schirmer test and tear breakup time.
- Fluorescein staining to identify corneal erosions or ulcers, which are frequent in advanced cases.
- Examination for concurrent abnormalities, such as medial canthal entropion, lateral canthal instability, and heavy facial folds contributing to mechanical distortion.

Differential diagnoses include primary ectropion, primary entropion, facial nerve paresis, and other causes of lagophthalmos; however, the combination of extreme eyelid length, massive facial skin redundancy, and bilateral symmetry strongly favors macroblepharon associated with breed conformation.

Treatment and Management

Management depends on the severity of signs and the degree of corneal compromise.
Medical therapy is indicated in mild cases or as supportive treatment:

- frequent lubrication with high-viscosity artificial tears or gels,
- periodic use of topical anti-inflammatory agents (e.g., cyclosporine for ocular surface inflammation),
- management of concurrent conjunctivitis or ulcerations with appropriate medications.

However, in the Neapolitan Mastiff, medical treatment alone rarely provides long-term resolution. Because the condition is fundamentally anatomical, surgical correction is often required.
Surgical intervention aims to:

- reduce the palpebral fissure length (partial lateral canthoplasty),
- improve eyelid apposition by tightening the lateral canthal tendon,
- correct associated ectropion or entropion,
- and stabilize the eyelid margins to protect the cornea.

Lateral canthoplasty is the most commonly recommended procedure; when combined with a wedge resection or correction of entropion/ectropion, it significantly improves ocular comfort and reduces the incidence of recurrent keratitis. In severe "diamond eye" cases, a comprehensive reconstructive approach may be necessary, addressing all periocular support structures simultaneously.

Prognosis

When appropriately treated, the prognosis for ocular comfort and long-term corneal health in affected Neapolitan Mastiffs is generally favorable. Early surgical intervention provides the best outcomes, as prolonged exposure keratitis can result in irreversible corneal scarring, pigmentation, and vision impairment. Timely correction restores eyelid function, stabilizes the tear film, and prevents chronic irritation and recurrent corneal ulcers. With adequate postoperative care, many dogs experience significant improvement in ocular comfort, maintain clearer corneas, and preserve visual function.
Conversely, if left untreated, affected dogs may endure persistent discomfort, repeated corneal injury, and progressive visual decline. Chronic inflammation can lead to deep stromal ulcers, corneal fibrosis, and secondary complications that compromise vision. Early recognition, surgical management, and ongoing ophthalmic monitoring are essential to safeguard ocular health and ensure the long-term welfare of the breed.

Eight-month-old Neapolitan mastiff with severe 'diamond eye'.
Source: veteriankey.com

OD - Diamond shape"
Source: Chirurgie oftalmologica veterinara, Iuliana Ionascu

Surgical intervention in "diamond shape"

In the upper eyelid, there is often lateral entropion combined with a variable central palpebral coloboma. In the lower eyelid, combinations of median ectropion and lateral and medial entropion are commonly present. These malpositions predispose the cornea to secondary lesions, ranging from superficial erosions to deep, recurrent ulcers.

Surgical correction requires a highly individualized approach, as each patient presents unique anatomical variations. The procedure typically follows a stepwise strategy:

1. Correction of the central palpebral coloboma of the upper eyelid,
2. Correction of upper eyelid entropion,
3. Correction of lower eyelid entropion.

Successful management of "diamond eye" in the Neapolitan Mastiff demands creativity and careful selection of combined surgical techniques to restore eyelid function, protect the cornea, and achieve lasting ocular comfort.

Entropion

Entropion is a conformational or acquired eyelid disorder characterized by the inward rolling of the eyelid margin, causing the eyelashes and periocular hair to contact the corneal and conjunctival surface. In the Neapolitan Mastiff, entropion is a common and clinically significant ocular condition due to the breed's brachycephalic-molossoid morphology, heavy facial folds, and excessive periocular skin, which create mechanical forces that favor eyelid inversion.
In this breed, entropion is frequently bilateral, may affect the upper and/or lower eyelids, and often occurs in combination with other conformational disorders such as macroblepharon, ectropion, and the "diamond eye" syndrome. The condition is usually congenital, although secondary entropion may develop due to scarring, chronic ocular irritation, or age-related changes.

Pathophysiology

Entropion in the Neapolitan Mastiff results from a combination of anatomical predisposition and mechanical forces:

1. Excessive eyelid length (macroblepharon) increases the mobility of the eyelid margin.
2. Periocular skin redundancy exerts inward traction on the eyelid.
3. Heavy facial folds and pronounced brachycephalic features amplify mechanical distortion.
4. Weak canthal tendons may reduce lateral and medial eyelid stability.

These factors lead to inward rolling of the eyelid margin, causing the eyelashes, cilia, or periocular hair to contact the cornea. The constant mechanical irritation triggers inflammation of the corneal epithelium, secondary ulceration, and eventually fibrosis and pigmentation if left untreated.

In severe cases, chronic contact may result in neovascularization and permanent vision impairment.

Clinical Signs

Clinical presentation varies depending on severity and chronicity:

- Early signs: epiphora (excess tearing), blepharospasm, mild conjunctival hyperemia.
- Intermediate signs: corneal erosions, mucopurulent ocular discharge, intermittent photophobia, and ocular discomfort.
- Advanced signs: superficial or deep corneal ulcers, pigmentation, vascularization, chronic keratitis, and possible reduction in visual acuity.

Diagnosis

Diagnosis is primarily clinical and relies on careful observation and ocular examination:

1. Palpation of the eyelid to assess tone, laxity, and mobility.
2. Eversion and manipulation of the eyelid to observe the degree of inversion.
3. Fluorescein staining to detect corneal erosions or ulcers.
4. Evaluation of tear film stability (e.g., tear breakup time) and Schirmer tear test for secondary keratoconjunctivitis sicca.
5. Assessment for associated conformational abnormalities, including macroblepharon, ectropion, and facial folds.

Differential diagnoses include spastic entropion, trichiasis, distichiasis, or post-traumatic cicatricial entropion. However, in the Neapolitan Mastiff, the primary entropion is largely conformational.

Management and Treatment

Management strategies depend on severity, age, and corneal involvement:
Medical Management

- Reserved for mild, intermittent entropion or puppies awaiting growth and eyelid maturation.
- Lubricating eye drops or gels to reduce corneal irritation.
- Topical anti-inflammatory therapy for secondary conjunctivitis or keratitis.
- Temporary tacking sutures (e.g., "hotz-celsus" or temporary mattress sutures) can stabilize eyelids in puppies until permanent surgery is feasible.

Prognosis

With timely surgery, prognosis is good, with restored eyelid function and corneal health; delayed treatment can lead to chronic ulcers and vision loss.

Surgical intervention in Entropion

Depending on the location, entropion can affect:

- the upper eyelid,
- the lower eyelid,
- both eyelids (total entropion),
- the medial canthus, or
- the lateral canthus.

Treatment is always surgical, but the approach varies depending on the age of the patient. In puppies, temporary corrective measures such as traction sutures or surgical staples can be applied to guide eyelid positioning until facial growth is complete. In adult dogs, definitive surgical correction is performed according to the location and severity of the entropion. It is essential to recognize that each patient is unique, and surgical planning must be individualized, particularly in cases of bilateral involvement, where both eyes are treated simultaneously.
Postoperative care includes gentle cleansing of the eyelid with sterile saline-soaked swabs and the application of topical antibiotic and anti-inflammatory ointments twice daily. Traction sutures or staples are usually well tolerated, and the use of a protective Elizabethan collar is optional in puppies.

Surgical Technique for Upper Eyelid Entropion

The procedure is performed under general anesthesia. The surgical field is prepared by trimming the periocular hair and disinfecting with a suitable antiseptic solution (e.g., povidone-iodine). Standard ophthalmic surgical instruments are required, and depending on skin thickness, non-absorbable nylon sutures (3/0 or 4/0) are preferred.
The width of the skin flap to be excised is assessed, and the upper eyelid is carefully elevated over the orbital rim to facilitate a smooth incision. The skin is then incised in a “melon slice” shape near the free eyelid margin. The skin flap is removed, and the eyelid margin is closed using either simple interrupted or continuous nylon sutures, starting at the medial canthus and extending beyond the lateral canthus in a descending trajectory. At the conclusion of the procedure, the free margin of the upper eyelid is restored to its anatomically correct position.
Postoperative care includes local cleaning with saline, application of antibiotic-anti-inflammatory ointment twice daily, and systemic anti-inflammatory therapy (preferably meloxicam) for 7 days. Systemic antibiotics are generally not required. Sutures are removed at 14 days postoperatively, and the protective collar is mandatory to prevent self-trauma.

Surgical Technique for Total Entropion

For total entropion, preoperative planning is crucial. The future incision lines are marked on the skin with a surgical marker, and the eyelid skin flap width is carefully determined. The surgical area is isolated with an adhesive fenestrated drape, and the eyelids are elevated over the orbital rim for a single, precise incision. A Jaeger spatula or index finger can be used to support the eyelid during skin incision.
The incision is made close to the free eyelid margin, and the skin flap is excised. The first suture is placed at the lateral canthus, and the free margin is sutured starting from the medial canthus using either continuous or simple interrupted nylon sutures (3/0 or 4/0).
The protective collar is essential postoperatively. It is recommended that the dog wears the collar for several days prior to surgery to become accustomed to it. Sutures are removed at 14 days post-surgery, after which the collar can be removed, but topical treatment should continue for an additional 2–5 days.
Postoperative scarring is usually minimal and masked by periocular hair. Common surgical errors include the use of absorbable multifilament sutures, which can cause excessive scarring, and incisions placed too far from the eyelid margin, which may compromise functional and cosmetic outcomes.
For total entropion correction, the surgical steps are identical to those described above, with the exception that the upper eyelid flap should include a portion of well-developed subcutaneous adipose tissue (paniculus). Marking the incision lines with a surgical marker is mandatory before draping, and the skin incision should include the adipose layer. Flap excision may be accompanied by minor bleeding, which is managed intraoperatively.

Suture pattern on total entropion surgery (Original Marciano)

Incision line for superior entropion (Original Marciano)

Incision line for total entropion (Original Marciano)

Constitutional ectropion in N.M (Original Marciano)

Keratoconjunctivitis Sicca (KCS)

Keratoconjunctivitis sicca (KCS), commonly known as dry eye, is a significant ocular disorder in dogs characterized by reduced aqueous tear production, leading to chronic ocular surface inflammation. While KCS can occur in many breeds, the Neapolitan Mastiff is predisposed due to brachycephalic-molossoid conformation, heavy facial folds, macroblepharon, and inward eyelid malpositions, which collectively exacerbate tear film instability and ocular surface exposure.
KCS is generally immune-mediated, although it can also be congenital, drug-induced, or secondary to chronic ocular surface disease. In Neapolitan Mastiffs, KCS frequently coexists with entropion, ectropion, and macroblepharon, making both diagnosis and management more challenging.

Pathophysiology

KCS results from deficient lacrimal secretion, which disrupts the protective tear film composed of aqueous, mucin, and lipid layers. The lack of adequate tear production leads to:

- Ocular surface desiccation
- Chronic inflammation of the conjunctiva (conjunctivitis sicca)
- Corneal epithelial compromise

In Neapolitan Mastiffs, conformational features such as redundant periocular skin and excessive eyelid length worsen tear film distribution, promoting dry spots, increased tear evaporation, and mechanical irritation. Over time, these changes perpetuate a vicious cycle of inflammation, further reducing lacrimal secretion and exacerbating ocular surface damage.

Clinical Signs

Affected Neapolitan Mastiffs may present with:

- Mucopurulent ocular discharge, often thick and tenacious
- Conjunctival hyperemia
- Blepharospasm and photophobia
- Chronic ocular discomfort, often manifesting as pawing at the eyes or rubbing against surfaces
- Dry, dull corneal appearance with irregular tear film

Early detection is essential, as chronic untreated KCS can rapidly lead to progressive corneal pathology.

Diagnosis

Diagnosis relies on a combination of clinical signs and objective tear assessment:

1. Schirmer Tear Test (STT) – values <10 mm/min are suggestive of KCS; <5 mm/min indicate severe deficiency.
2. Fluorescein staining to identify corneal epithelial defects.
3. Tear break-up time and tear film osmolarity can provide additional functional assessment.
4. Evaluation of concurrent conformational disorders, including entropion, macroblepharon, and facial folds, is essential to identify secondary contributions to tear film instability.

Differential diagnoses include corneal neurotrophic disease, drug-induced keratoconjunctivitis, and systemic endocrine disorders (e.g., hypothyroidism).
Management
Management of KCS in the Neapolitan Mastiff is multimodal and aims to restore tear production, protect the ocular surface, and control secondary inflammation.
Medical Therapy

- Topical immunomodulators such as cyclosporine A 0.2–2% or tacrolimus to stimulate tear production and reduce immune-mediated lacrimal gland destruction.
- Lubricating eye drops or gels to maintain corneal hydration and comfort.
- Topical antibiotics may be indicated in the presence of mucopurulent discharge or secondary infection.
- Systemic therapy (e.g., omega-3 fatty acids, doxycycline) can support ocular surface health and reduce inflammation.

Surgical Therapy
Surgical interventions may be indicated in severe or refractory cases:

- Parotid duct transposition (PDT) can provide a permanent source of lubrication for severely affected eyes.
- Temporary tarsorrhaphy or medial/lateral canthoplasty can protect the cornea in dogs with concurrent entropion or macroblepharon.

Complications and Corneal Lesions

Chronic KCS predisposes the Neapolitan Mastiff to a spectrum of secondary corneal lesions due to persistent tear film deficiency and ocular surface desiccation:

- Superficial corneal erosions
- Chronic keratitis
- Corneal pigmentation and vascularization
- Recurrent superficial or deep corneal ulcers
- Fibrosis and potential permanent visual impairment

In severe cases, untreated KCS can combine with conformational eyelid abnormalities, such as entropion or macroblepharon, amplifying corneal exposure and ulceration risk. Prompt medical and, if necessary, surgical intervention is critical to prevent progre
ssive corneal disease and vision loss.

Prognosis

With early detection and appropriate therapy, KCS can be well managed, and corneal integrity can be preserved. Prognosis depends on:

- Severity and duration of tear deficiency
- Presence of secondary corneal lesions
- Concurrent conformational disorders affecting eyelid function

Long-term therapy, including lifelong topical immunomodulators (mostly Tacrolimus) and lubrication, is often required to maintain ocular comfort and prevent vision-threatening complications.

Omega-3 Fatty Acid Supplementation in KCS

Dietary supplementation with omega-3 fatty acids, particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), can play a supportive role in the management of keratoconjunctivitis sicca (KCS) in the Neapolitan Mastiff. Omega-3 fatty acids exhibit anti-inflammatory properties by modulating the production of pro-inflammatory cytokines and reducing ocular surface inflammation, which is a key component in immune-mediated KCS.
In addition, omega-3 supplementation may improve tear film stability by enhancing the lipid layer produced by the meibomian glands, reducing tear evaporation and secondary corneal desiccation. Regular administration of high-quality omega-3 formulations, either through fish oil or prescription supplements, is particularly beneficial in chronic KCS cases, especially when combined with standard medical therapy such as topical cyclosporine or tacrolimus.
While omega-3 fatty acids are not a standalone treatment, their adjunctive use can contribute to improved ocular comfort, reduced conjunctival hyperemia, and potentially slower progression of secondary corneal lesions. Clinicians should select products with a verified content of EPA and DHA and monitor for gastrointestinal tolerance, particularly in large breeds like the Neapolitan Mastiff.

Corneal Ulcers in the Context of KCS

Corneal ulcers represent a significant complication in dogs affected by keratoconjunctivitis sicca (KCS), and understanding the different types is essential for proper diagnosis and treatment.

1. Superficial Corneal Ulcers

Superficial ulcers involve only the epithelial layer of the cornea. Despite being relatively easy to treat, they are often painful, as the posterior corneal stroma contains abundant sensory nerve endings, resulting in blepharospasm, photophobia, and epiphora.

- Diagnosis: Fluorescein staining readily identifies epithelial defects.
- Treatment: Standard therapy includes topical broad-spectrum antibiotics to prevent secondary infection and artificial tears to maintain ocular surface hydration. Prognosis is generally favorable if addressed promptly.

2. Indolent (Refractory) Corneal Ulcers

Indolent or refractory ulcers are more complex because the epithelial defect is pluristratified and poorly adherent to the underlying stroma. These ulcers are often non-healing despite standard topical therapy.

- Diagnosis: Fluorescein staining demonstrates persistent epithelial defects, often with rolled or loose edges.
- Treatment: Management requires mechanical debridement of the non-adherent epithelium, sometimes repeated 2–3 times to allow healing. Adjunct therapy includes topical antibiotics and lubrication, with consideration for topical anti-collagenase therapy in chronic cases.
- Prognosis: Healing is slower than for superficial ulcers, but prognosis improves with correct intervention.

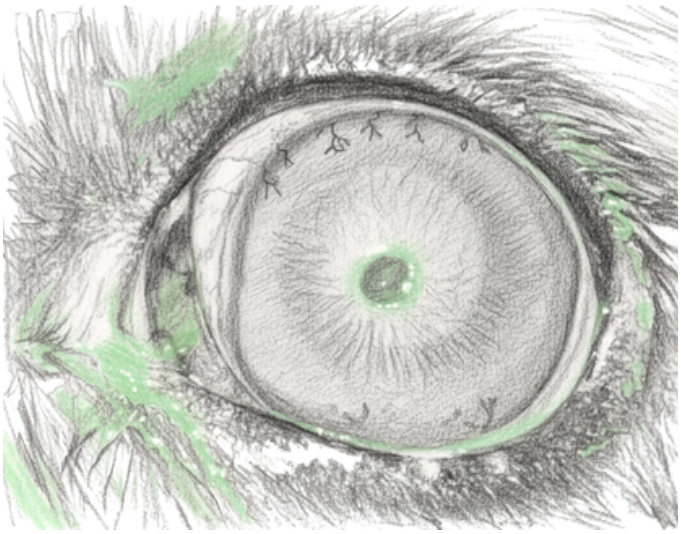
3. Melting (Keratolytic) Corneal Ulcers

Melting ulcers represent the most severe corneal complication and are a true ophthalmic emergency. They occur when corneal stromal collagen is degraded by enzymes (proteases, collagenases) released during infection or severe inflammation.

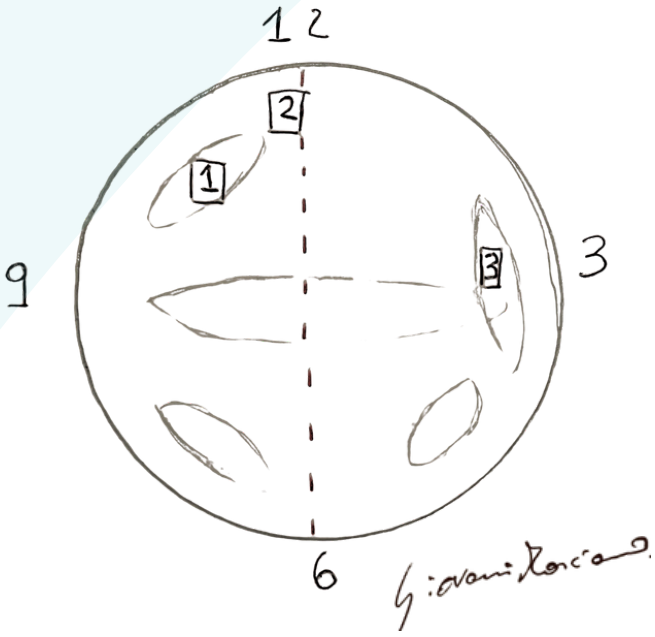
- Clinical features: Rapid stromal thinning, risk of perforation, intense pain, and corneal edema.
- Diagnosis: Fluorescein staining demonstrates stromal defects; corneal culture is recommended to guide therapy.
- Treatment: Management is aggressive and multi-modal:
  - Surgical intervention, often corneo-conjunctival flap (CCT), to provide structural support and promote healing.
  - Topical anti-collagenase therapy (e.g., EDTA, serum, or tetracycline).
  - Targeted topical antibiotics guided by culture results.
  - Protective contact lenses or collagen shields to stabilize the cornea and reduce mechanical trauma.
- Prognosis: Guarded to poor depending on depth of stromal loss, timely intervention is critical to prevent perforation and vision loss.

Clinical Pearls

- Fluorescein staining is a simple and effective tool for differentiating superficial, indolent, and melting ulcers.
- Pain severity correlates with stromal involvement: superficial ulcers are painful due to nerve endings, whereas indolent ulcers may appear less painful despite poor healing.
- Chronic KCS and eyelid conformational disorders (macroblepharon, entropion, ectropion) predispose to recurrent corneal ulcers, emphasizing the importance of a holistic approach that addresses tear deficiency, eyelid malposition, and ocular surface protection.
- The cornea signals distress through clinical signs, and it is the clinician's responsibility to respond promptly and appropriately to prevent irreversible damage.



Corneal ulcer – Fluorescein-staining epithelial defect of the cornea.(original Marciano)



The cornea acts as a mirror, reflecting the underlying cause of every ulcer and guiding us toward the correct diagnosis and treatment.
1) Positive fluorescein staining in the superior quadrant suggests the presence of upper eyelid entropion.
2) Fluorescein uptake over approximately half of the cornea indicates a likely total entropion affecting both upper and lower eyelids.
3) Fluorescein uptake on the medial portion of the cornea is indicative of medial entropion.
(original Marciano)

Cherry Eye in the Neapolitan Mastiff

Cherry eye refers to the prolapse of the gland of the third eyelid (nictitating membrane), a common ocular disorder in dogs. The gland normally contributes approximately 40–50% of the aqueous tear film, playing a critical role in maintaining ocular surface health. Prolapse occurs when the ligamentous attachments of the gland weaken, allowing it to protrude from the conjunctival sac, producing the characteristic red, swollen mass in the medial canthus.
While cherry eye can be seen in multiple breeds, the Neapolitan Mastiff is predisposed due to its brachycephalic-molossoid conformation, excessive periocular skin, and large facial folds, which increase mechanical stress on the gland and its supporting structures. This breed predisposition is similar to other giant breeds but is exacerbated by the Neapolitan Mastiff's heavy periocular anatomy, which may lead to earlier onset and bilateral involvement.

Etiology and Pathophysiology

Cherry eye results from congenital weakness or laxity of the retinacular ligament that anchors the gland to the periorbital tissues. Contributing factors in the Neapolitan Mastiff include:

- Excess periocular skin and heavy facial folds, creating mechanical pressure on the gland.
- Macroblepharon and eyelid laxity, allowing abnormal movement of the third eyelid.
- Genetic predisposition, as the condition often appears in young puppies (typically less than 2 years of age).

The prolapsed gland may lead to secondary ocular irritation, conjunctivitis, and reduced tear production if untreated, increasing the risk for keratoconjunctivitis sicca (KCS) and corneal lesions.

Clinical Signs

Affected Neapolitan Mastiffs typically present with:

- Visible red, swollen mass at the medial canthus of one or both eyes.
- Mucoid ocular discharge due to irritation.
- Mild blepharospasm or ocular discomfort, although pain is usually minimal.
- Secondary changes such as conjunctival hyperemia or early corneal irritation, particularly if the condition is chronic.

Cherry eye is usually unilateral initially, but bilateral involvement is common in predisposed breeds.

Diagnosis

Diagnosis is primarily clinical:

1. Visual inspection reveals a reddish, nodular mass in the medial canthus, often covered by a thin conjunctival layer.
2. Manual examination can differentiate prolapsed gland from conjunctival swelling or neoplasia.
3. Assessment of tear production (Schirmer Tear Test) is recommended, as chronic prolapse can reduce tear output and predispose to KCS.

Differential diagnoses include conjunctival cysts, neoplasms, and localized inflammation, but the characteristic location and appearance of the gland usually allow for straightforward diagnosis.

Cherry eye in N.M (original Marciano)

Management and Treatment

Conservative management (e.g., topical lubrication) may temporarily reduce irritation but does not correct the underlying problem. Definitive treatment is surgical replacement, with the primary goal of repositioning the gland to preserve its contribution to the tear film.

Surgical Techniques

1. Pocket (Morgan) technique – the most widely used method, creating a conjunctival pocket to anchor the gland in its normal position.
2. Avoidance of gland excision – removal of the gland is discouraged due to the high risk of postoperative KCS, especially in predisposed breeds like the Neapolitan Mastiff.

Postoperative care includes topical antibiotics and anti-inflammatory therapy, as well as protective collars to prevent self-trauma. Most dogs recover well, and recurrence rates are generally low (<10–15%) when proper surgical technique is applied.

Complications

If left untreated, cherry eye can lead to:

- Secondary KCS, due to reduced aqueous tear contribution.
- Chronic conjunctivitis and ocular irritation.
- Corneal lesions, including superficial erosions or ulceration from chronic exposure or mechanical irritation.
- Recurrence after surgical correction, particularly if improper technique is used.

Timely surgical intervention is therefore crucial to preserve ocular health, especially in breeds already predisposed to conformational ocular issues such as macroblepharon, entropion, and KCS.

Prognosis

The prognosis for Neapolitan Mastiffs with cherry eye is generally excellent with surgical replacement. Long-term ocular comfort is usually restored, and tear production is preserved, reducing the risk of secondary KCS. Recurrence is uncommon with proper technique, and most dogs achieve normal ocular function and appearance.

Retinal Dysplasia in the Neapolitan Mastiff

Retinal dysplasia (RD) is a congenital malformation of the retina in which the normal layering and development of retinal tissue is disturbed. The abnormal retina may display folds, rosettes, or invaginations; in severe cases, complete RD may lead to retinal detachment and blindness

RD can present in different forms:

- Focal or multifocal retinal dysplasia, with small folds or scattered spots in the retina.
- Geographic retinal dysplasia, where the lesion is larger, irregular, often horseshoe- or circular-shaped, and more likely to cause visual impairment.
- Complete retinal dysplasia, potentially with retinal detachment, leading to profound vision loss or blindness.

In many cases, especially mild forms, affected dogs might not show obvious clinical signs and retain functional vision, though small blind spots may exist.

Etiology and Predisposition

In dogs, RD is most often hereditary, although acquired forms may result from in utero insults such as viral infections, toxic exposure, radiation, or trauma.
Histopathologically, RD lesions correspond to disorganized retinal architecture: folds, rosettes, or invaginations of the outer nuclear layer.
Several breeds show a recognized predisposition — including spaniels, terriers, retrievers, and some giant breeds.

Specifically, one analysis of the records from the American College of Veterinary Ophthalmologists (ACVO) found a prevalence of retinal dysplasia (folds) of about ~7.2% (earlier period) / ~5.7% (later period) among "Mastiff" dogs — although it does not specify subtype or differentiate giant-breed subtypes.
This suggests that giant / mastiff-type dogs can be affected, and raises the possibility that the Neapolitan Mastiff may also be at risk — even if specific epidemiological studies for this breed and RD are lacking.

Clinical Presentation in Affected Dogs (and Implications for Neapolitan Mastiff)

Because RD arises early in development (often congenital), lesions are usually present at birth or become evident in puppies within the first weeks to months.
Possible clinical signs:

- Many dogs — especially with focal or multifocal RD — show no overt visual impairment; they may live normal lives, with only occasional "blind spots."
- In more severe forms (geographic or complete RD), signs may include: reduced vision, abnormal behavior in low light or unfamiliar environments, bumping into objects, reluctance to move, especially in dim lighting, or even blindness if detachment occurs.
- On ophthalmic exam: retinal folds (linear streaks), rosettes (round/oval lesions), areas of increased or decreased reflectivity, and in advanced cases retinal detachment.

Because the retina in the Neapolitan Mastiff must support a large globe and is subject to the breed's morphological stresses (heavy head, deep orbit, thick periocular tissues), one could speculate that any retinal maldevelopment might have additional functional impact compared to smaller breeds — though data are lacking.

Diagnosis

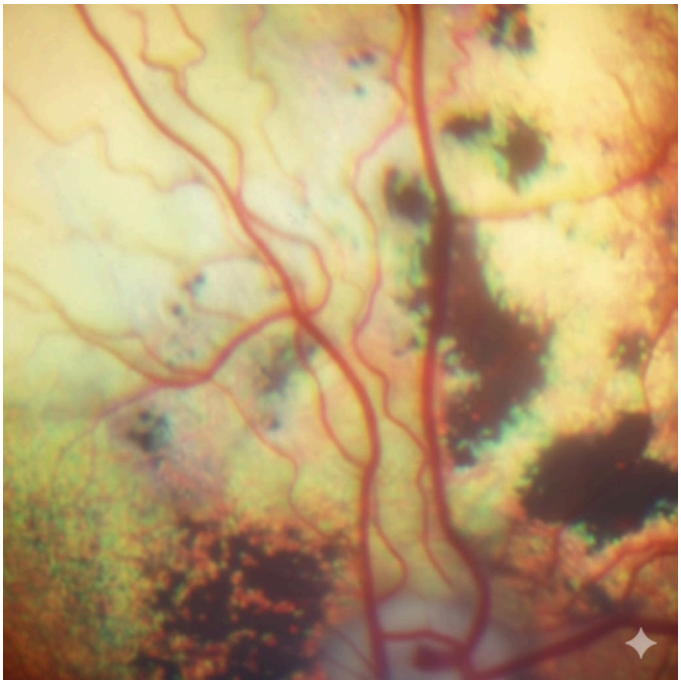
Diagnosis of RD relies on ophthalmic examination by a veterinary ophthalmologist: fundoscopy (direct or indirect), possibly enhanced with specialized imaging (like OCT, fundus photography), especially in subtle cases.
In some cases, electroretinography (ERG) may be used to assess retinal function; however, for non-degenerative RD (folds/rosettes), ERG may be normal, especially if many photoreceptors remain functional.
Because some lesions (e.g. focal folds) may become less obvious with age, a single negative exam in puppyhood does not guarantee lifelong absence.

Management & Prognosis

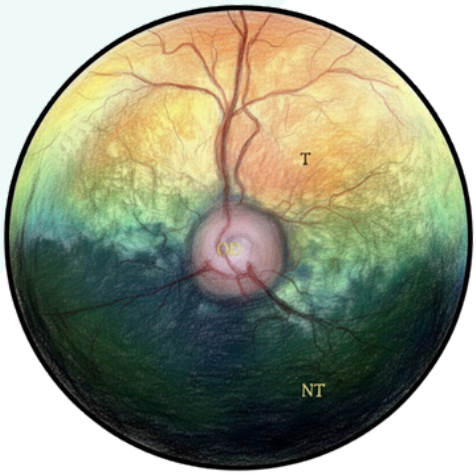
- There is no cure that restores normal retinal architecture. RD is a developmental defect, not a progressive degeneration — except when associated with secondary changes (e.g. detachment).
- In mild focal or multifocal RD, many dogs maintain functional vision; no treatment required, though periodic monitoring is prudent.
- For geographic RD or if retinal detachment occurs, prognosis for vision is guarded to poor. Retinal detachment may require surgical intervention (though such interventions in dogs are challenging and not always successful), and many cases end with partial or complete vision loss.

Breeding and Screening

- Because RD is largely heritable (or at least reproducible under certain breeding conditions), responsible breeders should include ophthalmic screening (fundus exam) in their health protocol, especially for giant/brachycephalic breeds.
- Given the documented 5–7% prevalence of RD in "Mastiff" dogs from ACVO data, even if not breed-specific, it's rational to assume a non-negligible risk in Neapolitan Mastiff lines.
- Until more breed-specific epidemiological data are available, ophthalmic screening should be considered for any Neapolitan Mastiff used for breeding or when planning litters.



Ocular fujndus showing retinal dysplasia
Source: www.msdvetmanual.com



Normal canine ocular fundus (AI image)

Posterior-Cortical Cataract in the Neapolitan Mastiff

In dogs, a posterior-cortical cataract (PCC) refers to an opacification located in the posterior cortical region of the crystalline lens — sometimes including the subcapsular or posterior-polar zone, but sparing the nucleus. This type of lens opacity can impair light transmission, scatter incoming light, and degrade visual acuity depending on its size, density, and progression.
Because opacities are in a region traversed by light just before the retina, even relatively small posterior cortical changes may degrade contrast sensitivity or impair vision under poor lighting conditions.

Prevalence and Breed-Specific Considerations: What We Know and What Remains Unclear

- According to the latest European College of Veterinary Ophthalmologists (ECVO) Hereditary Eye Disease Scheme, "cataract – posterior cortical, including posterior polar" is listed among lens disorders in the general disease classification for dogs.
- However — and critically — for many breeds including the Mastiff group (which nominally includes mastiff-type dogs such as the Neapolitan Mastiff), the inheritance pattern of PCC remains marked as "unknown" in the ECVO scheme; no validated genetic test is indicated.
- This means that while PCC has been observed in mastiff-type dogs, there is no conclusive evidence that in the Neapolitan Mastiff it behaves as a reliably inherited condition. Breed-specific epidemiological or genetic data are lacking.

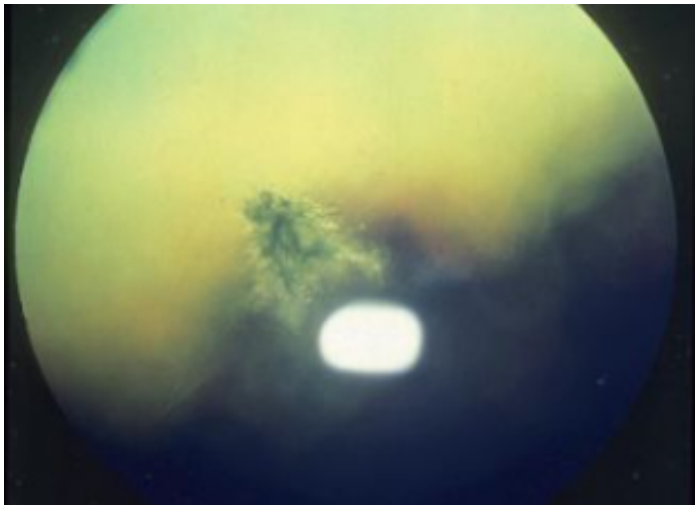
Clinical Features and Diagnosis

When PCC develops in a Neapolitan Mastiff (or any dog), clinical presentation and diagnosis follow standard ophthalmic procedures:

- Clinical signs may include gradual or stable cloudiness of the lens, difficulty seeing especially in dim light, reduced contrast sensitivity, hesitation, or poor navigation in low-light conditions. Behavioural changes such as reluctance to move in poorly lit areas may be present.
- On ophthalmic examination (slit-lamp biomicroscopy, indirect ophthalmoscopy), one may observe greyish-whitish opacities in the posterior cortex of the lens, possibly near the posterior capsule or along the visual axis. Opacities may be focal or diffuse, unilateral or bilateral; progression may be slow or absent.
- For dogs intended for breeding or screening, PCC is evaluated according to ECVO guidelines. Because of uncertainty regarding heritability and possible progression, detection of a PCC often leads to a "non-breeder recommended" classification.

Treatment and Prognosis

- Unlike progressive cataracts, posterior-cortical cataracts may stay stable for long periods and often do not severely affect vision.
- If vision becomes compromised — e.g., difficulty navigating, lens-induced inflammation, or owner concern — lens removal via phacoemulsification may be considered.
- In cases where the cataract is mild and not progressing, regular ophthalmic monitoring is recommended, checking for changes in opacity, lens stability, or development of complications (e.g., lens-induced uveitis or glaucoma).



Posterior cortical cataract
Source: www.ecvo.eu

CHAPTER 3

Skeletal and Joint Health in the Neapolitan Mastiff: Clinical Assessment

Introduction

The Neapolitan Mastiff is a giant, heavy-boned molossoid breed whose dramatic size, massive soft-tissue folds, and rapid growth make it particularly vulnerable to a range of orthopedic and skeletal disorders. As with many large and giant breeds, the biomechanical stresses placed on developing joints are considerable; however, in the Neapolitan Mastiff these stresses are amplified by excessive body mass, loose connective tissue, and breed-specific conformational traits. As a result, orthopedic disease represents one of the primary welfare challenges in this breed.

Among the most prevalent conditions are hip dysplasia and elbow dysplasia, both of which are strongly influenced by genetics but exacerbated by rapid growth, overnutrition, and improper conditioning. These disorders contribute to chronic pain, early-onset osteoarthritis, and lifelong mobility impairment. Cruciate ligament disease is also frequently encountered, partly due to the breed's substantial weight and relative stifle instability. Additionally, abnormalities associated with angular limb deformities, hypertrophic osteodystrophy (HOD), and panosteitis may appear during adolescence, particularly in fast-growing puppies.

The breed's extreme body mass predisposes adults to accelerated degenerative changes, with severe osteoarthritis often appearing earlier than in smaller breeds. Vertebral disorders, including spondylosis deformans and lumbosacral disease, may also develop due to chronic mechanical overload of the axial skeleton.

Because many of these conditions are inherited or strongly heritable, responsible breeding practices, early screening, controlled growth, and proactive orthopedic management are essential to preserving quality of life. Without proper preventive strategies and timely intervention, affected dogs may suffer chronic pain, reduced athletic ability, and significantly diminished longevity.

Hip Dysplasia

Hip dysplasia (HD) is a developmental disorder that affects the hip joint, causing laxity, instability, and osteoarthritis. This condition is commonly found in large and giant breed dogs, but it can also occur in small and medium-sized dogs, as well as in cats. HD was first described by Gerry Schnelle in 1935, and since then, numerous studies have sought to identify the causes and progression of the disease. Although some pathogenic aspects remain unclear, it is now certain that genetic causes are at the root of this common orthopedic condition.

Hip dysplasia (HD) is a multifactorial condition where environmental factors based on genetics allow the manifestation of the disease. Similar to what is observed in humans, dogs can also present chromosomal alterations that cause both dysplasia and osteoarthritis. Anomalies in these loci can lead to joint alterations not only in the hip but also systemically. An abnormal hip joint conformation induces an incorrect distribution of forces on the articular cartilage, leading to eburnation, inflammation, and osteoarthritis. Recently, it has been shown that some English Bulldogs have torsional deformities of the pelvis that cause acetabular retroversion and a deficit in acetabular coverage. In vitro studies, conducted through CT scans, have demonstrated that the cross-over sign (COS), present in dogs with poor acetabular coverage, can be caused by torsional alterations of the pelvis. This suggests that congenital or acquired variations in pelvic inclination and torsion can lead to reduced acetabular coverage, joint laxity, and subluxation of the femoral head. Joint laxity is considered by many researchers to be the main cause of the development of osteoarthritis. Other factors that favor the onset of HD include an increase in synovial fluid, an altered ratio between pelvic musculature and skeletal growth, a high amount of relaxin in puppies, and excessive weight gain in young dogs. The combination of these etiological causes, in different proportions from one subject to another, leads to an inevitable alteration of the hip joints. The progression of the disease is linked to the severity of the joint alteration and can vary in its presentation.

Clinical signs

Dogs with hip dysplasia (CHD) are classified into three categories:

- young dogs with subclinical form (4-14 months)
- young dogs with clinical form (4-14 months)
- adult dogs with arthritic manifestations

The severity of the condition can vary. A puppy with dysplasia typically shows the characteristic "bunny hop" gait with the hind legs together, reluctance to move and jump, and difficulty maintaining a quadrupedal stance. Young dogs may sit frequently during play, indicating joint discomfort. In these dogs, continuous subluxation causes stretching of the joint capsule, stimulating the mechanoreceptors of the capsule and the cartilage and periosteal nociceptors, causing pain of varying intensity. Dogs with hip dysplasia exhibit stiffness in the hind limbs and a widening or narrowing of the base of support. Generally, an increased load on the front limbs is observed.

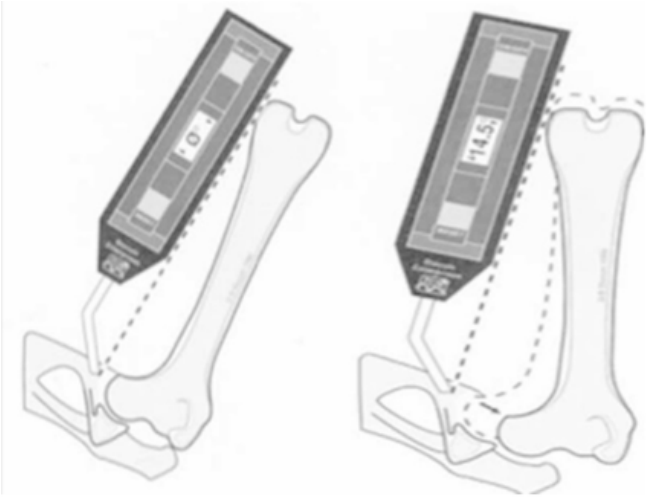
These behaviors are due to the attempt to spare the hip joint, reducing load and movement. As the disease progresses, dogs become lethargic and reluctant to move, often presenting with lumbosacral pain due to excessive load on this joint. Frequently, some dogs present with marked lameness in the front limbs caused by prolonged joint overload, which over t ime leads to alterations in the front joints as well.

Orthopaedic exam

Due to its congenital nature and progressive character, it is advisable to diagnose the condition early, when the dog is still in the prepubescent stage. The complexity of the disease requires a thorough orthopedic examination to detect clinical signs that are not visible with the standard V/D radiographic projection alone. The optimal period to detect hip dysplasia is between 3 and 5 months of age. During the initial vaccination visits, the veterinarian should guide the owners of dogs with signs of dysplasia or breeds predisposed to dysplasia to undergo a targeted orthopedic radiographic examination, which can diagnose possible joint laxity that may cause osteoarthritis. Dogs undergoing an orthopedic examination may present with: gait abnormalities, poor development of pelvic muscles, exercise intolerance, intense joint pain (arthralgia), accompanied by hip instability during external rotation and abduction of the joint. During the clinical examination, specific tests useful for diagnosing hip dysplasia can be performed, such as the abduction and external rotation test, the hip extension test, the Ortolani test, the Barlow test, and the evaluation of the subluxation (AS) and reduction (AR) angles.

- Ortolani Test: The dog is placed in dorsal (or lateral) recumbency, with the knee flexed. By applying slight pressure, the limb is abducted. The positivity of this test is indicated by the reduction of the hip into the acetabulum, generating the characteristic “clump”.
- Barlow Test: The dog is positioned as in the Ortolani test. Pressure is applied to the knee, with the femur placed vertically relative to the radiographic table. By simulating the physiological load on the femur, the limb is adducted towards the median plane. If there is excessive capsular and ligamentous laxity, the femur tends to subluxate, which is perceived by placing a hand on the examined joint. In this case, the test is positive.
- AS and AR Angles: These are evaluated using a goniometer (preferably the Slocum Electrogoniometer), with the animal always in dorsal recumbency.

The angle at which the femoral head subluxates (AS) is measured in adduction, and the angle at which the femoral head re-enters the acetabular cavity (AR) is measured in abduction. AS and AR are a quantitative assessment of capsular distension. The AS and AR angles are very useful in evaluating the laxity and conformation of the dorsal acetabular rim. These two data points must be considered to make a diagnosis, indicate a prognosis, and establish a therapeutic treatment. As the disease progresses, the AS and AR angles change. With the increase in the inclination of the dorsal acetabular rim, there is an increase in the subluxation angle and the reduction angle. This process evolves to the point of maximum capsular distension, where AS and AR almost overlap. Subluxation and reduction are generated by a slight oscillatory movement defined as the translation angle.



angle of reduction (AR) and subluxation (AS) measured by Slocum Electrogoniometer
Source: AIVPA JOURNAL - Italian journal of companion animal practice - 1/2014

Radiographic Examination

Hip dysplasia is diagnosed through radiographic examination; the clinical and radiographic findings together allow for the establishment of the correct therapeutic protocol. The radiographic study must be performed with the dog under anesthesia. The projections most commonly used in the diagnosis of HD are:

- Standard V/D with extended limbs
- V/D in distraction - Frog view V/D
- Dar view

Standard V/D with extended limbs

The most common radiographic projection for diagnosing hip dysplasia involves positioning the dog in dorsal recumbency on a V-shaped support, with the pelvic limbs extended, parallel, and slightly internally rotated. Even small deviations of the pelvis or variations in traction or rotation of the femurs can affect the results, overestimating or underestimating hip dysplasia. In the radiograph, the femurs should be parallel and symmetrical, as should the hemipelvis, and the patellae should be centered in the trochlear groove. The last lumbar vertebra should also be visible. This projection allows for the evaluation of joint congruity, the position of the femoral head relative to the dorsal acetabular rim, joint and periarticular morphology, and the presence of osteophytic proliferations.

- Joint congruity: Evaluated through the Norberg angle, which is considered physiological if equal to or greater than 105°. In young dogs, the presence of cartilage matrix can cause an underestimation of this angle.
- Position of the femoral head: The position of the femoral head relative to the dorsal acetabular rim (DAR) is a parameter for assessing joint laxity and acetabular filling.
- Joint/periarticular morphology: Based on the observation of alterations of the cranial acetabular rim, acetabular depth and flattening, and the silhouette of the femoral neck and head.
- Signs of osteoarthritis: In dysplastic subjects, arthritic changes such as the Morgan line, proliferations and fragmentations of the cranial acetabular rim, osteophytes and decalcifications on the femoral neck, and subchondral sclerosis can be observed.

V/D in distraction

This radiographic projection is used in growing dogs to assess capsular and ligamentous joint laxity, which, if excessive, can lead to joint degeneration. Unlike the standard V/D projection, this technique allows for the detection of joint laxity that is not normally visible due to the gluteal muscle push and the torsion of the joint capsule fibers. The V/D distraction projection recreates the physiological conditions of the dog in a quadrupedal position, allowing for the evaluation of the maximum separation of the joint heads. The technique described by Badertsher and modified by Dr. Vezzoni involves positioning the dog in dorsal recumbency on a V-shaped support, with the tibiae parallel to the radiographic table and the femurs flexed at 95°-105° relative to the spine.

A distractor is placed between the pelvic limbs to act as a fulcrum between the femurs. Joint laxity, one of the causes of canine hip dysplasia, can be measured using the distraction index (DI) according to Smith's method. This index is the ratio of the distance (d) between the center of the femoral head and the acetabulum to the radius of the femoral head (DI = d/r). A DI greater than 0.3 indicates a potential predisposition to osteoarthritic problems in adulthood, while values below 0.3 are considered normal.

Frog view V/D

The frog-leg projection is used to assess the filling of the acetabular cup caused by degenerative processes and hypertrophy of the round ligament. This filling pushes the femoral head out of the joint. The patient is positioned in dorsal recumbency on a V-shaped support, with the pelvic limbs abducted to the maximum physiological position, the knees flexed, and the tarsi together and slightly elevated with a radiology cushion underneath, so that the femurs remain parallel to the radiographic table.

Frog view V/D
Source: AIVPA JOURNAL - Italian journal of companion animal practice - 1/2014

DAR view

The DAR projection is used to evaluate the dorsal acetabular rim, which is crucial for keeping the femoral head within the acetabulum. The dog is positioned in sternal recumbency on a V-shaped support, with the tibiae elevated at 45° and parallel to the radiographic table, creating a vertical alignment of the pelvis. The projection is considered adequate when the ischial tuberosities are a few millimeters above the dorsal acetabular rim and the hemipelves are symmetrical. The dorsal acetabular rim angle (DARA) can be measured with a goniometer. In normal dogs, the dorsal acetabular rim is sharp and pointed, with an inclination of less than 7.5°. This projection is important for assessing the integrity of the DAR and for planning surgical interventions such as TPO or DPO.

Visualization of skeletal structures in DAR projection, the ischium is located dorsal to the dorsal acetabular rim.
Source: AIVPA JOURNAL - Italian journal of companion animal practice - 1/2014

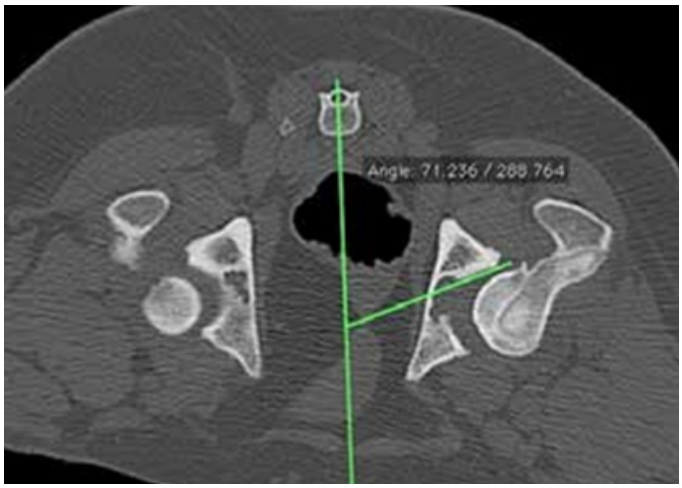
FCI Classification of Hip Dysplasia

Hip dysplasia is one of the most important hereditary orthopedic disorders affecting large and giant breed dogs, including the Neapolitan Mastiff. The Fédération Cynologique Internationale (FCI) has established a standardized radiographic grading system to evaluate the severity of hip dysplasia based on acetabular and femoral conformation, congruency of the coxo-femoral joint, and signs of secondary osteoarthritis.
The FCI scale includes five main categories, each reflecting the degree of anatomical abnormality and potential clinical impact:

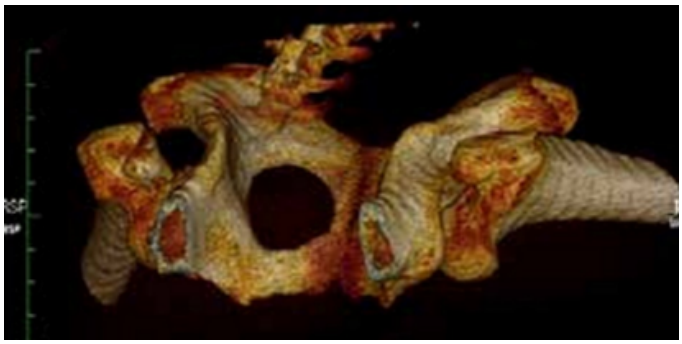
- A – Normal Hip: The coxo-femoral joint shows perfect congruency. The femoral head fits tightly within the acetabulum, with a well-rounded craniolateral acetabular rim and uniform joint space. The Norberg angle is ⩾105°. No radiographic signs of osteoarthritis are present. Dogs with grade A hips are considered optimal for breeding.
- B – Near Normal: Minor incongruence may be present, but no clear signs of osteoarthritis are detected. The acetabulum and femoral head remain nearly congruent, and the Norberg angle is approximately 105°. This grade is often considered acceptable for breeding, depending on the breed standard and national regulations.
- C – Mild Dysplasia: Moderate incongruence is evident, with flattening of the craniolateral acetabular rim and a Norberg angle around 100°. Early osteoarthritic changes may appear, including mild remodeling of the femoral head or acetabulum. Clinical signs may be absent or mild.
- D – Moderate Dysplasia: Clear subluxation or joint incongruency is present. The acetabulum is flattened, the femoral head may appear slightly deformed, and radiographic signs of osteoarthritis are evident. Dogs with grade D hips may experience lameness or decreased mobility and are usually excluded from breeding programs.
- E – Severe Dysplasia: Marked incongruence with subluxation or luxation of the femoral head is seen. Severe deformity of the femoral head and acetabulum is common, along with pronounced osteoarthritic changes. Affected dogs frequently develop chronic pain, reduced mobility, and early-onset osteoarthritis.

Tomographic examination

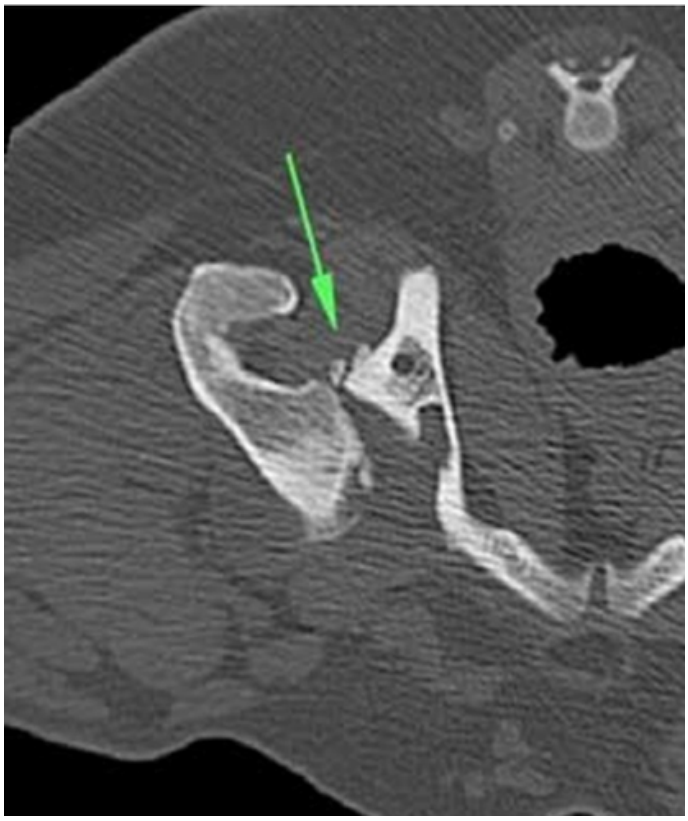
Computed tomography (CT) allows for the evaluation of the same aspects described for radiographic examination but provides greater precision and a quantitative and qualitative assessment not possible with radiographic examination. Additionally, Volta et al. demonstrated in vitro that even small positioning errors during radiographic projections can cause significant changes in the visualization of the pelvis. Thanks to the ability to verify the inclination of the pelvis through scout view during the CT scan, positioning errors could be reduced, allowing for a more reliable assessment of conformational changes compared to radiographic examination.



Determination of dorsal acetabular rim angle (DARA) from CT image.
Source: AIVPA JOURNAL - Italian journal of companion animal practice - 1/2014



3D reconstruction of the dog's pelvis subjected to CT examination.
Source: AIVPA JOURNAL - Italian journal of companion animal practice - 1/2014



presence of fragmentation of the caudal acetabular rim (arrow)
Source: AIVPA JOURNAL - Italian journal of companion animal practice - 1/2014

Treatment

Hip dysplasia (HD) manifests in various forms and levels of joint degeneration, causing different clinical pictures. Additionally, the clinical or radiographic picture does not always correspond to the same symptoms. Therefore, each case should be evaluated individually and treated in the most appropriate way, choosing from the various current therapeutic options.

- Conservative treatment: Conservative management of hip dysplasia in dogs aims to reduce arthritis, control pain, and limit inflammation. It is indicated in young dogs with minimal changes, older dogs with osteoarthritis, cases with systemic diseases, limited performance, or economic constraints. Key strategies include weight management to reduce joint load, controlled exercise to strengthen muscles without overloading joints, physiotherapy to improve muscle mass and reduce pain, and anti-inflammatory therapy (NSAIDs or short-term steroids) to facilitate mobility. Nutraceuticals support cartilage and provide mild anti-inflammatory effects. Joint injections with hyaluronic acid, platelet-rich plasma, or mesenchymal stem cells may further promote cartilage repair and limit inflammation.

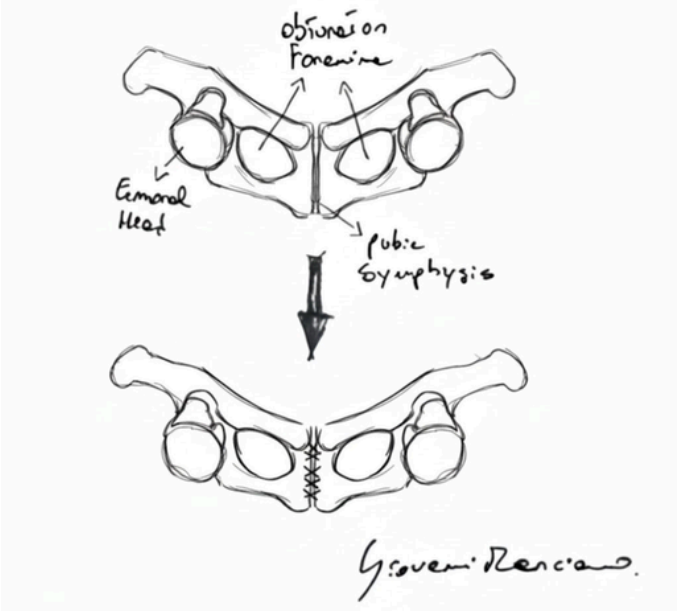
Together, these measures optimize joint function and quality of life without surgical intervention.

- Surgical Treatment: Surgical treatments for hip dysplasia aim to prevent or reduce the formation of osteoarthritis, which is the primary and disabling cause of the complex pathological process. There are no procedures that can be considered better than others; each surgical treatment is indicated for patients with a specific clinical and symptomatic profile. Almost all interventions have a "useful" age window for treatment, which can vary. Surgeries are divided into two categories: reconstructive and replacement.

1. Reconstructive surgeries

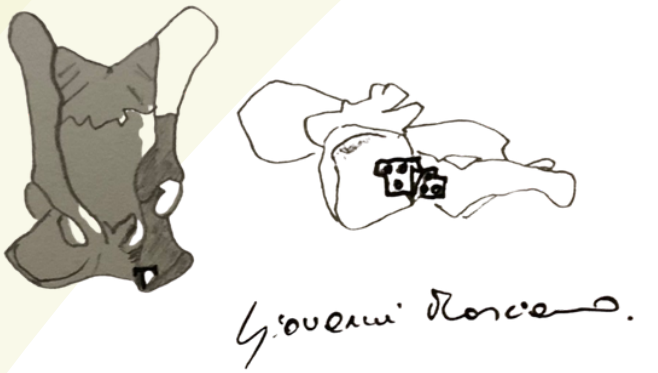
- Juvenile Pubic Symphysiodesis (JPS): a minimally invasive technique that uses electrocauterization to close the pubic symphysis. This procedure changes the joint biomechanics, increasing acetabular ventroversion, reducing femoral head subluxation, and improving dorsal acetabular coverage. If performed on young dogs before the onset of osteoarthritis, it can prevent the degenerative joint process. The procedure is effective when the pubic symphysis is particularly active. Studies have shown that the technique is no longer effective in dogs older than 22 weeks. It is indicated for dogs between 3 and 5 months of age, with 5 months reserved for giant breeds. To achieve good results with JPS, the dog must meet specific clinical and radiographic criteria:
- Positive Ortolani test-
- Reduction Angle (RA) between 15° and 40°
- Subluxation Angle (SA) between 0° and 15°
- DAR less than 12°, without erosions
- Displasia Index (DI) between 0.4 and 0.7
- Mild or absent clinical signs

The surgical procedure is simple and minimally invasive. The dog is placed in dorsal recumbency, a small incision is made on the pubis, and a spatula is used to protect the underlying tissues. Electrocauterization is performed at intervals of 2-3 mm along the entire pubic symphysis. No special post-operative precautions are needed. It is important to note that symphysiodesis produces phenotypically normal dogs even if they are genetically dysplastic. Recent studies have developed measurements to identify dogs that have undergone JPS. It is ethically correct to inform owners of the changes caused by the procedure and to always recommend sterilization to avoid fraudulent practices.



Juvenile Pubic Symphysiodesis (JPS). With growth, the acetabular coverage of the femoral head increases. (Original Marciano)

- The triple pelvic osteotomy (TPO): is a prophylactic technique discovered by Hohn and Janes in 1969 and refined by Slocum in 1992. It is used to prevent coxofemoral osteoarthritis in dogs with hip dysplasia that show joint laxity but have minimal or no signs of arthritis. Ideal candidates for this procedure are dogs aged between 5 and 10 months, with reduction angles (RA) between 20° and 40°, subluxation angles (SA) between 10° and 30°, and DAR between 10° and 30°, with preserved joint morphology and minimal or no arthritis. The surgical technique involves two osteotomies at the level of the ilium and ischium, and a pubic ostectomy. After freeing the bone stumps, the free segment is ventroverted according to the calculated subluxation angle and stabilized with pre-angled plates of 20°, 25°, and 30°. The ischium osteotomy can be stabilized with a surgical wire cerclage. The procedure can be performed bilaterally, but a second intervention on the other hemipelvis is recommended after 4-6 weeks. This technique requires manual skill, good anatomical knowledge, and adequate training. Complications can be serious, including implant detachment, neurological damage, excessive closure of the pelvic canal, excessive coverage of the femoral head, progression of arthritis, and abnormal gait. The use of stable-angle plates has reduced the incidence of screw loosening, but the instability created by the osteotomies limits the use of TPO to specific patients. Despite its initial popularity, the technique has been less used due to the high incidence of complications.

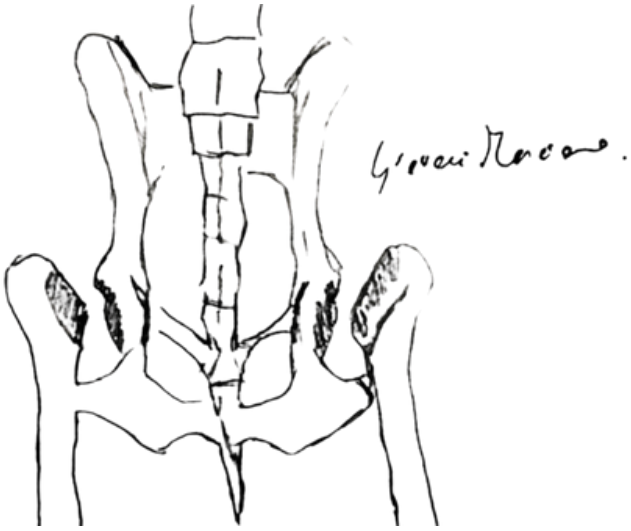


Osteotomy and pubic ostectomy, performed during the TPO procedure, which allow the rotation of the acetabular stump and its stabilization with a dedicated plate. (Original Marciano)

- Double pelvic osteotomy: This technique is less invasive compared to the triple pelvic osteotomy (TPO) as it allows the ischium to remain intact. The stability provided by the integrity of the ischium and the stabilization of the ilium drastically reduces post-operative complications. Additionally, the memory of the ilium causes compression of the plate on the cranial stump, reducing screw loosening. The inclusion criteria for patients are similar to those of TPO; it is recommended to perform the procedure on dogs aged between 5 and 8 months to take advantage of the plasticity of the ilium and allow for easy rotation, avoiding fractures. The procedure is similar to TPO but involves only pubic and iliac osteotomies and an additional 5° rotation to the subluxation angle assessed during the clinical visit. Complications include ischium fractures and plate failure on the caudal stump.

- Femoral head and neck ostectomy (FHO): is a surgical technique used in various cases, such as the removal of prosthetic implants, treatment of Legg-Calvé-Perthes disease in small dogs, femoral head fractures, acetabular fractures, chronic hip dislocations, and in some cases, to treat hip dysplasia. This technique must consider potential alterations in other parts of the pelvic limb, such as cruciate ligament ruptures, patellar luxations, or tarsal alterations. FHO involves the resection of the femoral head and neck up to the lesser trochanter, leading to the formation of a pseudoarthrosis with a fibrous capsule containing a synovial membrane. The prognosis depends on various factors, including the surgical technique, duration of the lesion, age of the patient, size, weight, and the presence of concomitant pathologies.

Dogs undergoing FHO may have the operated limb shorter, muscle atrophy, reduced joint range of motion, and decreased knee and tarsal angulation. Full recovery can take 6 to 8 months, with younger dogs tending to recover better. This technique can be considered when therapeutic options are limited by economic factors, but it is the veterinarian's responsibility to select the most suitable candidates.



Bilateral femoral head and neck ostectomy. (Original Marciano)

2. *Replacement surgeries*

- Total hip replacement (THR): reconstructs the pathological joint using prosthetic components without altering joint morphology or biomechanics. It is indicated for osteoarthritis due to hip dysplasia, chronic or traumatic femoral head dislocations, dysplastic coxofemoral joints, post-FHO revisions, non-synthesizable femoral head fractures, and post-traumatic arthritis. The procedure involves FHO, preparation of the femoral canal, and placement of prosthetic components including an acetabular cup, head-neck unit, and stem, fixed by press-fit, screws, or cement. Ideal candidates are dogs over 6 months with severe prepubescent alterations or debilitating arthritis; in elderly dogs, a lateral plate may be added to distribute load and prevent femoral fractures. Advances in materials and instrumentation have reduced complications and morbidity, improved load distribution, and decreased infections. Possible complications include sciatic neuropraxia, pulmonary embolism, femoral head dislocation, infection, aseptic loosening, neoplasms, and acetabular changes, with a risk of 12%-13%. THR significantly reduces pain, restores gait, and provides a prognosis from good to excellent, though extensive surgical training is required to minimize complications.

Bilateral hip prosthesis, on the left a stable angle plate was placed on the lateral side with a support function .Source: AIVPA JOURNAL - Italian journal of companion animal practice - 1/2014

Elbow Dysplasia

Elbow dysplasia is a hereditary condition that involves abnormal development of the elbow joint. It often manifests within the first year of life and is particularly relevant in large and giant breeds. Elbow dysplasia encompasses several conditions that, individually or together, can compromise the functionality and physiology of the elbow joint. These conditions include fragmentation of the coronoid process of the ulna (FCP), ununited anconeal process (UAP), and osteochondrosis/osteochondritis dissecans of the humeral trochlea (OC/OCD). The pathogenic mechanisms are of polygenic origin and cause alterations in the shape and function of the joint. Additionally, they are often influenced by secondary factors such as a high caloric intake in the diet and excessive physical exercise during the bone growth phase, which predispose to the advancement of the pathology

Fragmentation of the coronoid process

is one of the most common orthopedic growth disorders, with the first clinical signs appearing between 4 and 6 months (Andreea ISTRATE 2019).

The lesions can vary, including fragmentation, complete or incomplete fissuring, and osteochondral erosion with fragmentation or fissuring.

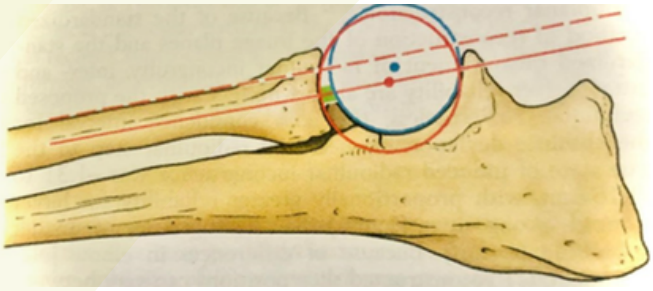
Mechanical load alteration can be caused by:

1. Radioulnar incongruence (RUI): which is due to the incongruence between the articular surfaces of the elbow. This condition affects the articular surfaces of the radius and ulna, caused by asynchronous growth in the length of the two bones, where the radius is shorter than the ulna or the radial head is positioned laterally to the medial coronoid process of the ulna (short radius syndrome). In this case, a significant portion of the load is transferred from the humeral trochlea to the medial coronoid process. The stress induced by excessive load can damage the subchondral bone of the medial coronoid process, causing fissuring or fragmentation.

2. -Humeroulnar incongruence (HUI): can affect the distal humerus and proximal ulna, where the radius of the ulnar trochlear notch is smaller than the radius of the humeral trochlea. This geometric anomaly results in abnormal forces and loads on the medial coronoid process, although a certain degree of incongruence is physiological (Danourdis A. 2015).

3. Rotational instability of the radius and ulna relative to the distal humerus: can be primary or secondary. The primary form is caused by incompatibility between the radial notch and the radial head or by the angulation of the humeroulnar surface, causing damage to the medial coronoid process (MCP). The secondary form is due to the disparity in tension between the supinator and pronator muscles, which can lead to overloading of the MCP and compression of the articular surfaces. Ununited anconeal process (UAP) compromises the stability of the elbow joint and limits mediolateral movements.

The etiology of ununited anconeal process (UAP) involves two main hypotheses: failure of the ossification center to fuse and articular incongruence. In large and giant breeds, the separate ossification center tends to mineralize between 3 and 4 months and fully fuse by around 5 months. If fusion does not occur within this period, it can lead to UAP. Articular incongruence occurs during growth due to asynchronous growth of the radius and ulna, with the radius growing faster than the ulna, causing pressure on the anconeal process and interfering with its fusion and ossification



Measurement of radioulnar incongruity using two circles, one following the trochlear notch of the ulna (blue) and another following the concave arc of the radial head (red). Radioulnar incongruity is measured by the distance between the two circles(green space.
Source: SPENCER A. JOHNSON 2017

Osteochondrosis is a common orthopedic condition in growing animals, often associated with elbow dysplasia. This condition causes lesions on the medial coronoid process, the humeral condyle, and the anconeal process. It is caused by an alteration in endochondral ossification, leading to chondrocyte necrosis and the formation of erosions. Fragmentation of the affected area can lead to calcification of the fragment and osteochondritis dissecans (OCD). Another hypothesis suggests that cartilage lesions are caused by constant forces on the cartilage, inhibiting endochondral ossification and causing fissures.

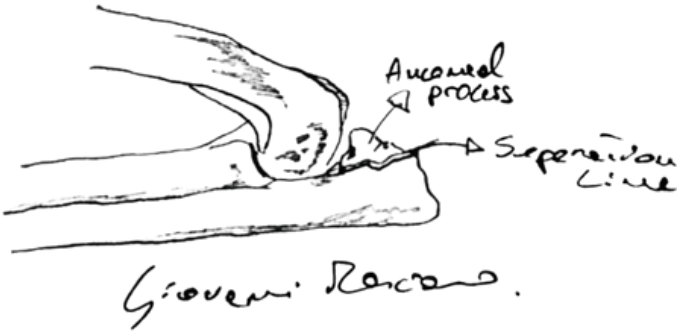
Clinical signs

Elbow dysplasia is characterized by bilateral lameness, with the first clinical signs visible between 5 and 7 months of age, especially in large and giant breeds. Animals show exercise intolerance in the early morning or after rest. Observation of the animal includes evaluating walking and trotting, and lameness may also be evident during direction changes. The physical examination is performed with the animal standing and in lateral recumbency, assessing joint stability, pain, crepitus, and range of motion. Pain can be induced during hyperextension with lateral rotation, and there may be a reduction in the range of motion.

Radiographic examination

Radiographic examination is essential for early diagnosis and can be performed between 4 and 5 and a half months of age. Early radiographic study requires 4 projections, with the patient correctly positioned, and can be performed under sedation or anesthesia. The radiographic projections for diagnosing elbow dysplasia include extended mediolateral, flexed mediolateral, craniocaudal, and 15° pronated craniocaudal views .

Each projection allows for the evaluation of different aspects of the joint, such as articular incongruence, the presence of osteophytes, and osteochondrosis of the medial humeral condyle. However, a complete diagnosis can be challenging due to the complexity of the joint and the overlapping of structures.



Failure of union of the anconeal process (UAP) (original Marciano)

Radiographic evaluation of medial compartment syndrome and secondary osteoarthritis. Location of osteophytes (a) Proximal aspect of the anconeal process, (b) cranial margin of the radial head, (c) cranial portion of the medial coronoid process, (d) lateral supracondylar crest, (f) medial contour of the humeral trochlea, (g) medial contour of the coronoid process. Finally, sclerotic processes are visible in the trochlear notch of the ulna (e) and in the subchondral bone of the humeral trochlea phenomena of osteochondrosis. Source: Lau SF, Theyse LF, Voorhout G, et al. : Radiographic, computed tomographic, and arthroscopic findings in LabradorRetrievers with medial coronoid disease. Vet Surg 44:511-520, 2015.

Based on the elements observed in the radiographic study, the International Elbow Working Group (IEWG) established a classification system for elbow dysplasia in 2001, ranging from grade 0 (normal) to grade 3 (severe).

Tomographic examination

Computed tomography is a widely used diagnostic technique for elbow dysplasia, with greater sensitivity and specificity than radiography for detecting fragmentation or fissuring of the medial coronoid process. However, analyzing cartilage tissue is more challenging. The presence of osteophytes, sclerosis, fissures, fragmentation, cysts, and necrosis can indicate conditions such as FCP, medial compartment syndrome, and OC/OCD. Computed tomography also allows for the evaluation of radioulnar and humeroulnar incongruence. Although useful, arthroscopy has disadvantages such as high costs, the need for specialized personnel, and general anesthesia

Arthroscopy

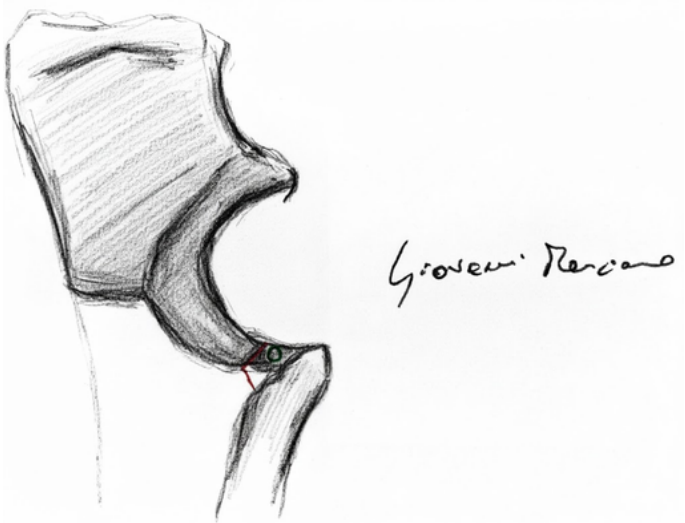
In elbow dysplasia, arthroscopy allows for the identification of cartilage lesions on the humeral condyle caused by friction with the medial coronoid process, assessing their depth and extent. It also enables the examination of subchondral bone exposure and coronoid process fragmentation, as well as the diagnosis of synovitis or tendon tissue degeneration at the insertion of the flexor muscle on the medial epicondyle of the humerus

Surgical treatment

The treatment of elbow dysplasia is generally surgical, aiming to eliminate pain and slow the progression of degenerative processes. Timely treatment is crucial for prognosis. In the early stages, osteoarthritis is mild, and the removal of fragments from the medial coronoid process through arthrotomy or arthroscopy is effective. Necrotic fragments cause adhesions, synovitis, pain, and osteoarthritis, and their removal can reduce irritation of the synovium and joint capsule.

- Subtotal ostectomy of the medial coronoid process (SCO): is a surgical technique used to treat dogs with medial coronoid process disease (MCD) and mild osteoarthritis. SCO is performed to remove bone fragments and degenerative cartilage lesions, eliminating contact between opposing joint surfaces. It can be done through arthrotomy or arthroscopy, with the latter reducing degenerative processes. Patient preparation includes sedation, anesthesia, hair clipping, and limb disinfection.

After preparation, access to the joint is made from the medial side with a sterile needle to verify correct positioning. A second access is enlarged with a scalpel blade to insert the arthroscope. An exploratory arthroscopy is performed, and if medial coronoid process fragmentation is detected, it is removed with a curette. However, coronoidectomy may not be effective in cases of non physiological joint incongruity, requiring SCO with corrective osteotomy or BURP to correct the incongruity. The treatment of joint incongruity aims to restore congruence between joint surfaces to reduce overload in the medial compartment. To date, proposed treatments focus on radioulnar and rotational incongruity. Radioulnar incongruity can be addressed through corrective osteotomy or ostectomy.



representation of line of SCO (red line) relative to the typical location of radial incisure fragmentation (blue line) (original Marciano)

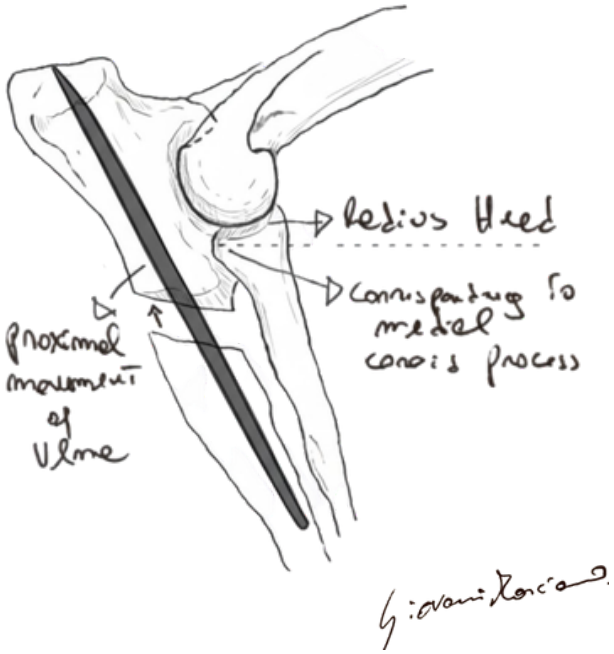
- Distal Ulnar Ostectomy (DUO): is considered an early treatment. This surgical technique is used in puppies aged between 4 and 6 months and is recommended in cases of mild to moderate incongruity, even in the absence of lameness or evident clinical signs. Around 6 months of age, the interosseous ligament is not yet fully developed, so it cannot limit the range of motion between the radius and ulna during DUO. For skeletally mature subjects, in addition to DUO (Distal Ulnar Ostectomy), interosseous ligament release (ILR) can be performed. DUO is carried out distally to the interosseous membrane using an oscillating blade to mobilize the proximal ulna and correct the step between the radius and ulna.

It is a simpler technique compared to PUO, with lower morbidity, does not require stabilization implants, and the most common complication is damage to the radial periosteum, which can lead to synostosis during healing.

Distal ulnar ostectomy
Source: Brinker 2006

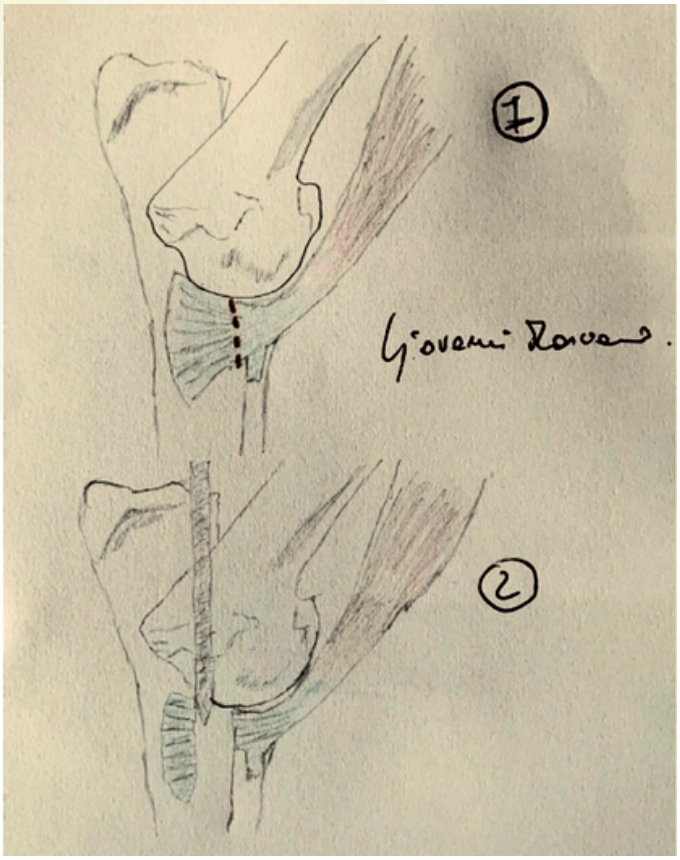
- PUO (Proximal Ulnar Osteotomy): is a corrective procedure, like DUO, used to treat radioulnar joint incongruity. It can be performed between 6 and 10/12 months of age. The goal is to restore congruence between the radius and ulna by measuring the step between their proximal ends and performing the ostectomy according to this measurement, to push the ulna distally

- Bi-oblique Dynamic Proximal Ulnar Osteotomy (BODPUO): is recommended to reduce the caudal migration of the proximal ulna segment and the formation of bone callus at the osteotomy site. It is performed in a caudoproximal-craniodistal and distomedial direction, proximally to the interosseous ligament, on skeletally mature subjects. In PUO, intramedullary pin fixation may be recommended to prevent displacement and deformities of the ulna. Complications include forces exerted by the triceps brachii and intramedullary pin breakage.



Proximal ulnar osteotomy with intramedullary screw (original Marciano)

- Biceps Ulnar Release Procedure (BURP): is a surgical treatment aimed at neutralizing the compressive forces exerted by the distal portion of the biceps brachii and brachialis muscles on the medial coronoid process. This constant traction can cause stress and fragmentation of the coronoid process. BURP is indicated for mild cartilage damage and subchondral sclerosis limited to the radial notch, as it can help prevent cartilage degeneration and reduce friction in the medial compartment. The procedure can be performed via arthroscopy or arthrotomy, involving a tenotomy of the ulnar insertion of the biceps tendon, which is then repositioned laterally. The patient can return to normal physical activity within 4-6 weeks, and the procedure can be performed bilaterally in the same session



The biceps ulnar release procedure, involves cutting the portion of the biceps tendon that causes repetitive impaction of the radial head against the coronoid process of the ulna. This procedure can be performed arthroscopically as demonstrated here (original Marciano)

In cases of moderate to severe osteoarthritis, treatment should be palliative to alleviate symptoms and halt further joint degeneration. The main surgical treatments are SHO (Humeral Sliding Osteotomy) and PAUL (Proximal Abducting Ulnar Osteotomy). SHO shifts the medial humeral condyle to reduce the load on the medial elbow compartment. PAUL, recommended for dogs aged 12 months to 9 years, involves a proximal ulnar osteotomy to shift the load from the medial to the lateral compartment, improving lameness, pain, and joint swelling. Other solutions for treating medial compartment syndrome include PURO (Proximal Ulnar Rotational Osteotomy), ERHO (External Rotational Humeral Osteotomy), and CUE (Compartmental Unicompartmental Elbow Arthroplasty). PURO externally rotates the proximal ulna segment by 30°, reducing medial load by 10% and increasing lateral load by 25%. ERHO externally rotates the distal humerus segment by 15°, reducing medial load by up to 50%. CUE is less invasive than total elbow replacement and is used in the final stages of the syndrome. Other treatments include cartilage flap removal for osteochondrosis, arthrodesis for chronic pain, and total elbow replacement for advanced osteoarthritis.

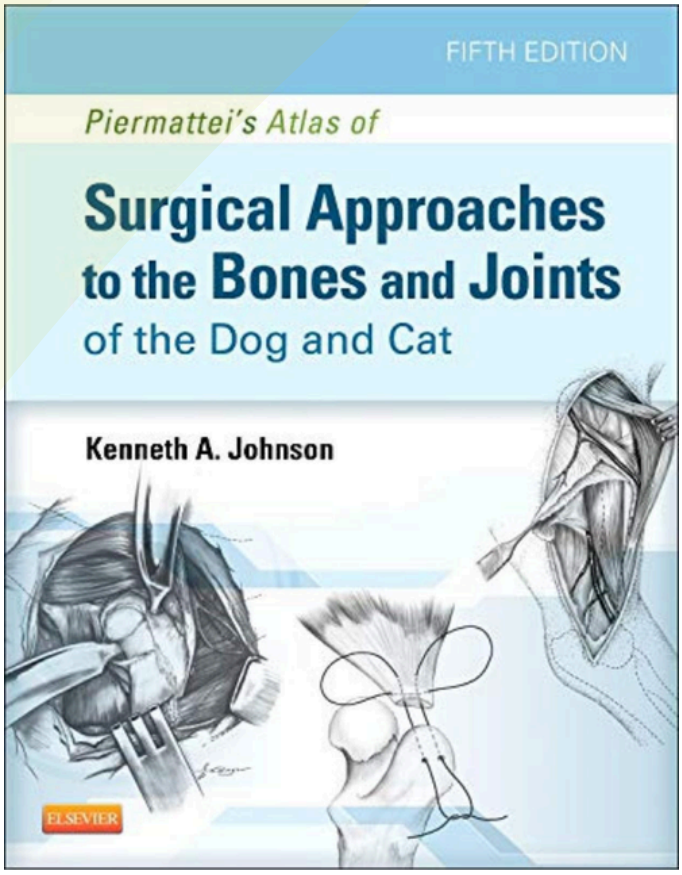
- Dynamic ulnar osteotomy proximal bi-oblique (BODPUO): is a surgical technique used to treat medial compartment disease (MCD), ununited anconeal process (UAP), osteochondritis dissecans (OCD), and joint incongruity (IA) in patients aged between 5 and 12 months. Introduced by Fitzpatrick and Yeadon, this technique aims to correct radioulnar incongruity and normalize loading forces on the medial elbow compartment. It can be combined with intra-articular treatment in cases of cartilage lesions on the coronoid process or the humeral trochlea. BODPUO is closely related to proximal ulnar osteotomy (PUO), which often requires fixation of the proximal ulnar segment with an intramedullary pin to prevent excessive migration. BODPUO avoids unwanted caudal movements of the proximal segment due to the maximum obliquity of the osteotomy and the contribution of the interosseous membrane.

Conservative treatment

Conservative treatment for osteoarthritis includes the use of non-steroidal anti-inflammatory drugs and regular joint exercise. Studies have compared the results of conservative treatment with surgical treatments (arthrotomy and arthroscopy), showing that arthroscopy is superior to both arthrotomy and conservative management, while arthrotomy did not show better results than conservative treatment. Other non-surgical and palliative options include intra-articular injections of corticosteroids, hyaluronic acid, and blood-derived products or stem cells, but these treatments are limited due to high costs and duration. Another option is joint denervation, used in the advanced stages of elbow arthritis. It can be performed surgically or with drugs such as botulinum toxin A, capsaicin, or intra-articular saporin (SPENCER A. JOHNSON 2017)

Post-operative care for Hip and elbow dysplasia surgery

Activity should be restricted for several weeks; wound care must follow veterinary instructions and an Elizabethan collar used; administer prescribed medications as directed; maintain balanced nutrition and supplement only if indicated; monitor the surgical site and report signs of infection or complications promptly; after the initial postoperative period, implement structured rehabilitation to prevent muscle atrophy and restore joint function; provide a quiet, comfortable environment for recovery.



"Piermattei's Atlas of Surgical Approaches to the Bones and Joints of the Dog and Cat", is widely regarded as the definitive reference for small animal orthopedic surgery. This comprehensive atlas provides step-by-step guidance on surgical approaches to the bones and joints of dogs and cats, making it an essential resource for veterinary students, surgeons, and clinicians.

The book is richly illustrated, combining detailed photographs, diagrams, and anatomical drawings to clearly demonstrate each surgical approach. Every procedure is carefully described, highlighting key anatomical landmarks, critical structures to avoid, and technical nuances to ensure safe and effective surgery.

Covering the entire musculoskeletal system—from the forelimb and hindlimb to the spine, pelvis, and skull—the atlas provides both fundamental techniques and advanced surgical strategies. It bridges the gap between theoretical anatomy and practical clinical application, making it invaluable for both learning and reference in the operating room.

Overall, Piermattei's Atlas is recognized for its clarity, precision, and practical focus, establishing itself as a cornerstone in small animal orthopedic surgery literature.

CHAPTER 4

NUTRITIONAL AND METABOLIC FACTORS IN NEAPOLITAN MASTIFF HEALTH

Introduction

Canine nutrition has evolved significantly over the past century, shaped by changing economic conditions, scientific advances, and shifting breeder practices. Historically, dogs were fed kitchen scraps, simple soups, or bones; as prosperity increased, diets became richer and increasingly meat-based, sometimes leading to metabolic stress or developmental imbalances.

For a giant molossoid breed like the Neapolitan Mastiff, whose rapid growth and massive adult body weight place exceptional demands on the developing skeleton, nutrition is not merely supportive—it is a primary determinant of musculoskeletal health. Balanced feeding during growth helps prevent orthopedic disease, joint instability, and metabolic imbalances frequently observed in giant breeds.

Proteins

Proteins are essential structural and metabolic components, forming muscles, enzymes, hormones, and immune mediators. In the Neapolitan Mastiff puppy, high-quality protein is necessary to support lean mass development without promoting excessive growth velocity. While earlier theories suggested that high protein intake could cause orthopedic disease, modern research shows that protein quantity is less critical than total caloric intake and mineral balance. What matters is providing a digestible, balanced protein source within a controlled-energy diet suitable for giant-breed puppies.

Carbohydrates

Carbohydrates supply readily available energy while sparing proteins for structural functions. In large-breed nutrition, carbohydrates should be provided in digestible, well-cooked forms (e.g., rice, certain grains, vegetables). Moderation is key: excessive caloric intake—regardless of nutrient source—accelerates growth and increases the risk of joint laxity and skeletal developmental disorders in the rapidly growing Mastino.

Minerals

Minerals, particularly calcium and phosphorus, play a central role in bone formation and skeletal stability.

Giant-breed puppies like the Neapolitan Mastiff have a narrow safe range of calcium consumption, making them especially vulnerable to both excess and deficiency.

Oversupplementation—often due to misguided attempts to “strengthen the bones” during growth—can disrupt endochondral ossification and contribute to osteochondrosis, angular limb deformities, and other developmental orthopedic disorders.

Maintaining a controlled calcium level (approximately 1% DM) and a balanced Ca:P ratio is essential. Trace minerals such as zinc, manganese, and copper must also be provided in appropriate, regulated amounts, as deficiencies or excesses can affect cartilage maturation and joint health.

Vitamins

Vitamins support metabolic function, immune health, and bone development. Fat-soluble vitamins A and D, essential for bone metabolism, must be supplied with caution because their excess is difficult to eliminate and may cause toxicity.

In a balanced commercial diet formulated for giant-breed puppies, all essential vitamins are already present in appropriate concentrations. Additional supplementation—especially when combining multiple fortified products—can easily lead to overdosing. This is a common and preventable issue in large-breed breeding programs.

Nutritional Needs of Large and Giant-Breed Puppies

Dogs represent one of the most morphologically diverse species in the world, and nutritional needs vary widely with size. Giant-breed puppies like the Neapolitan Mastiff must grow slowly and steadily, avoiding rapid weight gain that outpaces skeletal maturation.

Their diets should feature:

- Moderate caloric density
- Controlled and balanced mineral content
- High-quality protein
- Adequate essential fatty acids (especially EPA & DHA)

Calcium levels must be carefully regulated, and supplementation should be avoided unless explicitly indicated. Growth-specific diets should be maintained until 18–24 months, when skeletal development is complete.

Nutrition and Skeletal Health in the Neapolitan Mastiff

The Neapolitan Mastiff's substantial mass and rapid growth predispose it to a range of orthopedic issues, including hip dysplasia, elbow dysplasia, osteochondrosis, and panosteitis. Nutrition plays a pivotal preventive role. Excess energy intake or mineral imbalance during the first year of life significantly magnifies the risk of these disorders.
A properly controlled diet helps regulate growth velocity, promotes correct mineralization, supports joint stability, and reduces long-term orthopedic burden. In this breed, nutrition should be considered a fundamental tool for preserving musculoskeletal integrity across the lifespan.

Nutrition and Gastric Dilatation–Volvulus Prevention in the Neapolitan Mastiff

Nutrition plays a central role in maintaining the health, longevity, and functional soundness of the Neapolitan Mastiff, a giant breed predisposed not only to orthopedic disease but also to gastrointestinal emergencies such as Gastric Dilatation–Volvulus (GDV). Proper dietary strategies contribute to balanced growth, optimized musculoskeletal development, and the reduction of risk factors associated with gastric instability. Because of the breed's massive size, deep chest conformation, and frequently sedentary lifestyle, adopting evidence-based nutritional guidelines is essential for long-term wellness.

Energy Intake and Body Condition

Controlling caloric intake is one of the most important steps in preventing both orthopedic overload and GDV. Overfeeding increases fat deposition, reduces gastric motility, and predisposes to excessive gastric filling—an important contributor to dilatation. Maintaining a lean body condition score (4/9–5/9) helps reduce abdominal pressure, improves breathing mechanics, and decreases the risk of gastric torsion. Neapolitan Mastiffs grow rapidly, so their energy intake must be carefully calculated to avoid both overgrowth and excessive meal volume, which are associated with skeletal abnormalities and gastric instability.

Macronutrient Balance

A balanced macronutrient profile—high-quality proteins, controlled fats, and digestible carbohydrates—supports muscle development while maintaining gastrointestinal efficiency. Highly digestible proteins (from poultry, fish, or hydrolyzed sources) reduce fermentation byproducts that contribute to gas formation, while moderate fat levels prevent delayed gastric emptying. Carbohydrates should be provided in the form of digestible starches and fiber-balanced sources to support stable intestinal transit without promoting bloating.

Dietary Fiber, Gastric Motility, and Gas Management

Dietary fiber must be used thoughtfully. Soluble fiber supports gut health and stabilizes digestion, while excessive insoluble fiber increases fecal bulk and may promote gas accumulation—undesirable in a breed predisposed to GDV. A balanced fiber fraction improves gastric emptying and reduces the intestinal fermentation that leads to gaseous distension. Prebiotic fibers such as FOS or MOS support microbiome stability, indirectly decreasing the risk of excessive gastric gas production.

Meal Structure and Feeding Management

Nutritional prevention of GDV is strongly linked to feeding practices. Neapolitan Mastiffs should be fed two to three small meals per day instead of one large meal to avoid sudden gastric overfilling. Sudden ingestion of large food volumes is a major risk factor for acute dilatation. Dogs must eat slowly, and the use of slow-feeder bowls is often recommended. Access to water should be free, but large water intake immediately before or after meals should be avoided. Feeding from elevated bowls remains controversial; current evidence leans toward feeding at ground level for GDV prevention unless orthopedic conditions justify elevation. Vigorous exercise, running, or jumping must be avoided one hour before and at least two hours after meals, as physical activity alters gastric emptying patterns and increases mobility of abdominal structures.

Mineral Balance and Gastric Function

Excessive mineral intake, particularly calcium and sodium, may influence gastric secretions and motility. Diets formulated for giant breeds ensure appropriate mineral levels that support skeletal health without contributing to delayed digestion. Maintaining correct calcium–phosphorus balance prevents metabolic disruptions that could indirectly influence muscular tone of the gastrointestinal tract.

Probiotics, Digestive Enzymes, and Gastroprotective Additions

Probiotics and digestive enzymes are increasingly recognized as beneficial for giant breeds, improving nutrient absorption and reducing gastrointestinal gas accumulation. Probiotic strains help maintain a balanced microbiota, limit dysbiosis, and reduce intestinal fermentation. Omega-3 fatty acids assist in reducing systemic inflammation, including that affecting the gut, and contribute to improved overall gastrointestinal function. Certain nutraceuticals, such as ginger and low-dose carminatives, may also assist gastric emptying when appropriately used.

Growth Nutrition and Long-Term Stability

Puppy nutrition is critical in GDV prevention. Overgrowth, excessive caloric density, and rapid weight gain increase abdominal mass and reduce thoracic-abdominal stability. Feeding correctly formulated giant-breed puppy diets with controlled calcium and energy density supports steady growth and avoids disproportionate body development that predisposes to gastric instability. Lean growth also reduces the risk of orthopedic disorders—hip dysplasia, hypertrophic osteodystrophy, and panosteitis—conditions that often modify feeding patterns and contribute to fluctuations in gastric motility.

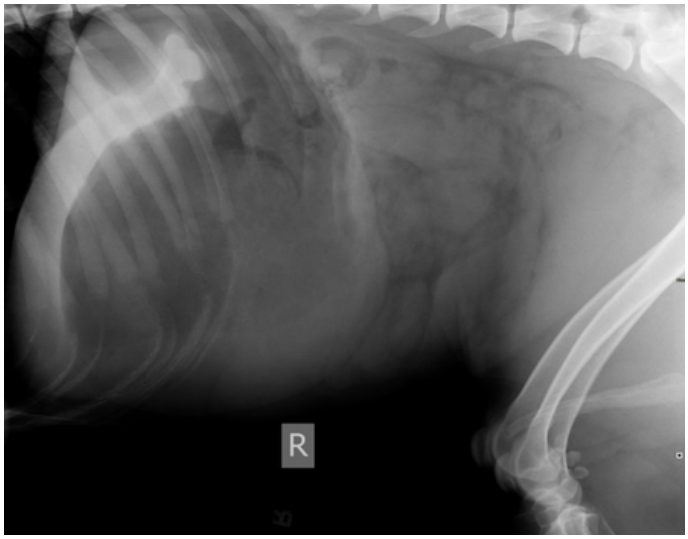
Panosteitis, Appetite Changes, and GDV Considerations

Panosteitis, a self-limiting inflammatory condition common in rapidly growing large-breed dogs, can indirectly influence GDV risk through fluctuating appetite, altered feeding behavior, and reduced mobility. Puppies experiencing pain episodes may eat irregularly or rapidly when appetite returns, contributing to meal-related gastric stress. Managing panosteitis through controlled growth rates, balanced mineral intake, and anti-inflammatory nutritional support (omega-3s, antioxidants) helps stabilize eating patterns and reduces abrupt gastric volume variations.

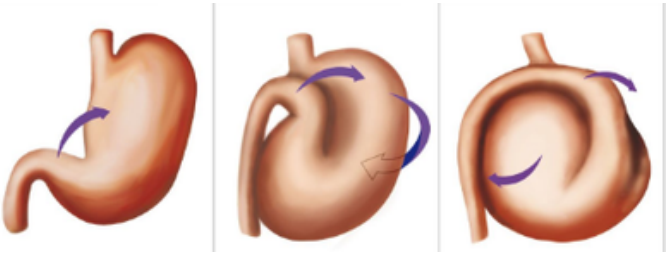
Hydration Strategies and Gastric Stability

Hydration must be consistent and moderate throughout the day. Allowing a dog to drink large volumes of water at once—especially before or after meals—can increase gastric distension. Moistening kibble with warm water may improve digestibility, although soaking for prolonged periods should be avoided to prevent fermentation. Partial wet feeding can reduce meal bulk and improve gastric comfort.

A comprehensive nutritional strategy for the Neapolitan Mastiff is one of the most effective tools for preventing GDV while supporting musculoskeletal health. Through controlled growth, appropriate meal structures, balanced macronutrients, optimized mineral intake, and digestive-supportive components, it is possible to significantly reduce the breed's predisposition to gastric dilatation–volvulus. Nutrition thus becomes not only a foundation for structural development but also a central preventive measure against one of the most serious and life-threatening conditions affecting giant breed dogs.



Gastric dilation and volvulus, abdominal radiograph, right lateral view - Note the fundus and pylorus are markedly distended with gas opacity (gastric dilation) and the fundus is ventral to the dorsally displaced pylorus ("reverse C" sign, "Popeye's arm" sign, or "Smurf's hat" sign), providing radiographic evidence of volvulus.
Source: www.merckvetmanual.com



This diagram illustrates the movement of the pylorus during GDV. In the normal dog the pylorus is located cranially on the right-hand side of the abdomen.
Source: academy.royalcanin.com

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Nutrition and Osteoarthritis Management in the Neapolitan Mastiff

Osteoarthritis (OA) represents one of the most significant clinical challenges in the Neapolitan Mastiff, a breed whose massive body structure, rapid growth, and lifelong biomechanical stress make joint degeneration both common and often debilitating. While pharmacologic therapy, physiotherapy, and weight management remain key pillars of treatment, nutrition is an equally fundamental—yet often underestimated—component in both the prevention and clinical management of osteoarthritis. Proper dietary strategies can slow the progression of joint disease, reduce inflammation, support cartilage health, and improve overall mobility and quality of life.

The Crucial Role of Body Weight Control

Excess body weight dramatically increases mechanical stress on the hips, stifles, elbows, and vertebral column—areas already predisposed to pathology in the Neapolitan Mastiff. Adipose tissue is not merely passive mass: it is an active endocrine organ that releases pro-inflammatory cytokines, worsening joint inflammation and cartilage breakdown. Achieving and maintaining ideal body condition is therefore one of the most impactful nutritional interventions. Controlled-energy diets, careful monitoring of caloric intake, and regular body condition scoring (BCS) play a decisive role in reducing clinical signs and delaying the need for pharmacological treatments.

Anti-Inflammatory Nutrients and Their Benefits

A targeted nutritional approach includes ingredients known to modulate inflammation and support joint tissues.

Omega-3 fatty acids (EPA and DHA)—particularly from fish oils—are among the most evidence-based supplements for OA. They reduce the production of inflammatory mediators, improve weight-bearing scores, and decrease reliance on NSAIDs. In large, heavy breeds like the Neapolitan Mastiff, long-term omega-3 supplementation is considered a cornerstone of nutritional therapy.

Antioxidants, such as vitamins E and C, selenium, and polyphenols, also contribute by reducing oxidative stress within joints, slowing tissue degeneration.

Curcumin, boswellia, and green-lipped mussel extract provide additional anti-inflammatory support and are frequently included in veterinarian-approved joint diets.

Chondroprotective Ingredients for Cartilage Support

Certain nutrients help protect and rebuild cartilage, offering structural benefits for osteoarthritic joints. These include:

- Glucosamine and chondroitin sulfate – support cartilage matrix integrity and reduce degradation.
- MSM (methylsulfonylmethane) – offers mild anti-inflammatory and analgesic effects.
- Hyaluronic acid – enhances synovial fluid viscosity and joint lubrication.
- Collagen peptides – assist in maintaining cartilage resilience and elasticity.

Complete "joint diets" for large breeds often combine several of these components, ensuring steady nutritional support.

Managing Growth to Prevent Adult OA

For the Neapolitan Mastiff, prevention begins early. Rapid or excessive growth during the first months of life contributes to abnormal biomechanical stress and increases the risk of hip and elbow dysplasia—two major precursors of osteoarthritis. Proper calcium-phosphorus balance, moderated caloric density, and the avoidance of high-energy puppy foods not formulated for giant breeds are essential to reduce these developmental risks. Thoughtful nutrition in youth protects joint health well into adulthood.

Digestive Health and Inflammation

Emerging research shows that gastrointestinal health influences systemic inflammation. Diets containing high-quality, digestible proteins, moderate fat levels, and fermentable fibers help stabilize the microbiome, indirectly reducing inflammatory mediators that can worsen OA-related discomfort. For breeds prone to digestive sensitivity, such as the Mastino Napoletano, this link may be particularly relevant.

A Multidisciplinary Nutritional Strategy

Nutritional management of osteoarthritis in the Neapolitan Mastiff must be integrated with clinical treatment, physical rehabilitation, and lifestyle adjustments. When guided by a veterinarian, nutrition becomes a powerful therapeutic tool—one capable of improving locomotion, decreasing pain, and significantly enhancing the dog's long-term well-being.

Nutritional Influences on Cardiac Health in the Neapolitan Mastiff

Cardiac health in the Neapolitan Mastiff represents a delicate balance between genetic predisposition, body mass, metabolic demands, and environmental factors—among which nutrition plays a central and often underestimated role. As a giant and heavy-bodied breed, the Mastino places a considerable workload on its cardiovascular system. Suboptimal dietary management can intensify this strain, accelerating the onset of myocardial dysfunction, compounding hemodynamic stress, and potentially interacting with underlying predispositions such as dilated cardiomyopathy (DCM). Understanding the nutritional foundations of cardiac wellness is therefore essential for clinicians, students, and breeders working with this unique breed.

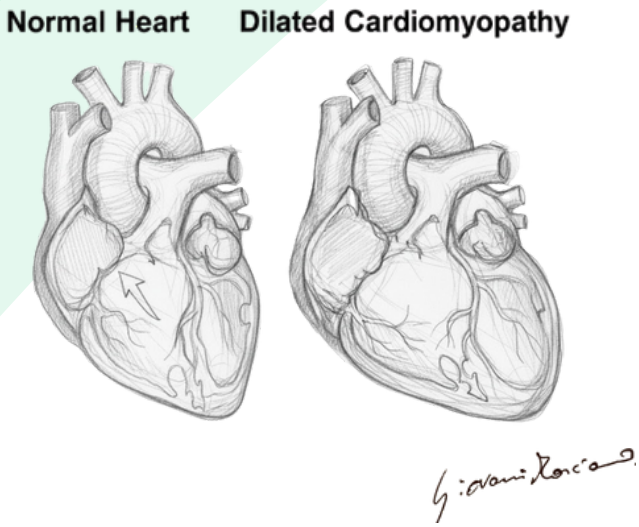
Nutrition significantly modulates cardiac workload through its influence on body condition, metabolic rate, and systemic inflammation. Excess calorie intake and poor weight management can rapidly lead to obesity—a critical risk factor for cardiac disease in giant breeds. Overweight Mastini experience increased circulating blood volume and higher cardiac output requirements, forcing the heart to sustain chronic pressure and volume overload. This metabolic environment favors ventricular hypertrophy, reduced myocardial efficiency, and heightened neurohormonal activation, ultimately predisposing the dog to heart failure. Conversely, a carefully controlled caloric intake, aimed at maintaining a lean body condition score, can substantially reduce cardiac strain and slow the progression of subclinical disease.

Macronutrient balance is equally important. High-quality animal proteins support the maintenance of lean muscle mass, including cardiac muscle, while preventing sarcopenia—a condition particularly relevant in aging Mastini, where muscle loss shifts more metabolic burden onto the heart. Adequate taurine and L-carnitine levels are fundamental to myocardial function, as these nutrients support energy metabolism within cardiomyocytes and help maintain normal contractility. Although taurine deficiency–associated cardiomyopathy is more commonly documented in other large breeds, giant breeds fed unconventional or poorly formulated diets may also be at risk, especially when exposed to grain-free or boutique diets lacking appropriate amino acid balance. Ensuring consistent access to complete, veterinary-supervised formulations can therefore reduce preventable myocardial compromise.

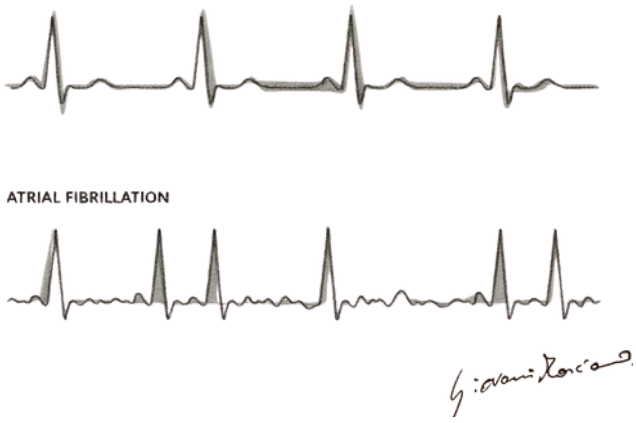
Micronutrients further influence cardiac health through oxidative balance, vascular tone, and neurohormonal regulation. Omega-3 fatty acids—particularly EPA and DHA—have well-established cardioprotective effects, helping reduce systemic inflammation, modulate arrhythmias, and improve endothelial function. Their inclusion in the diet of the Neapolitan Mastiff may support healthier cardiac remodeling and reduce circulating inflammatory mediators associated with chronic disease. Controlled sodium intake is another cornerstone of dietary management, especially in dogs with early-stage cardiac insufficiency. Maintaining lower dietary sodium can help minimize fluid retention and mitigate the activation of the renin–angiotensin–aldosterone system, thereby reducing the risk of hypertension and symptomatic heart failure.

Digestive health also indirectly contributes to cardiac wellness. Because the Mastino is predisposed to gastrointestinal issues—including gastric dilatation–volvulus—dietary strategies that support regular digestion, stable microbiota, and reduced fermentative load can improve nutrient absorption and metabolic efficiency. A stable gastrointestinal environment ensures more predictable bioavailability of cardioprotective nutrients, preventing fluctuations that may affect myocardial performance. Additionally, minimizing postprandial stress through frequent, smaller meals may help regulate metabolic load and maintain more consistent cardiovascular demands throughout the day.

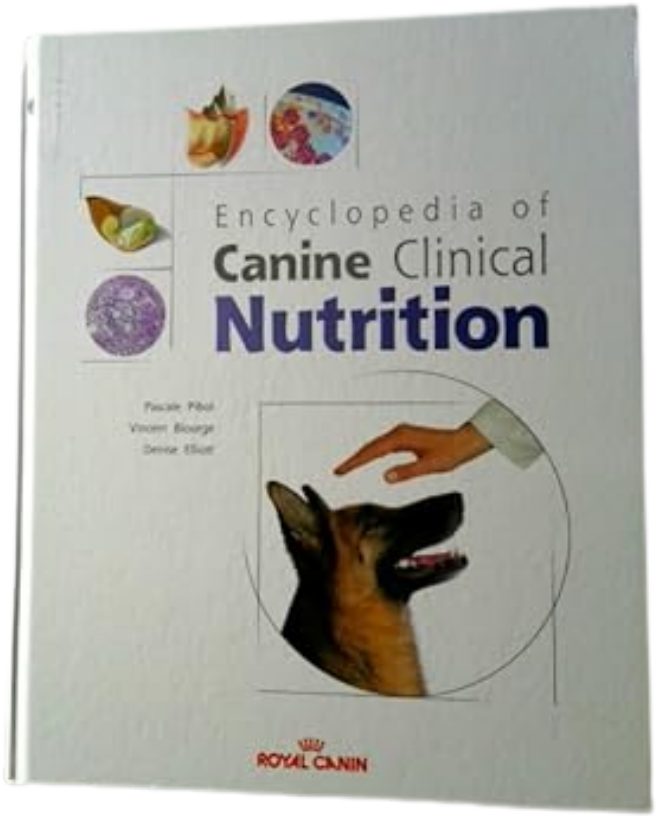
Ultimately, nutritional management should be integrated into a comprehensive cardiac prevention strategy. Regular assessment of body condition, tailored diet plans, and periodic monitoring of cardiac biomarkers and echocardiographic parameters allow clinicians to detect early signs of dysfunction and adjust dietary recommendations accordingly. For owners, clear dietary guidelines provide a practical and impactful way to support the longevity and quality of life of their Mastino. For students and young veterinarians, understanding the deep connection between metabolism and cardiac physiology increases clinical awareness and strengthens preventive practice—an essential skill when working with giant breeds such as the Neapolitan Mastiff.



A representation of dilated cardiomyopathy, characterized by an enlarged, weakened heart muscle with stretched ventricular walls and reduced contractile strength. This condition leads to impaired pumping efficiency, congestive heart failure, and progressive exercise intolerance, especially in large and giant breeds. (original Marciano)



Atrial fibrillation is a common arrhythmia in large and giant-breed dogs, characterized by rapid, chaotic electrical activity in the atria. Instead of coordinated contractions, the atria quiver, leading to an irregularly irregular heartbeat and reduced cardiac efficiency. On ECG, it appears as the absence of P waves and highly variable R–R intervals. This rhythm often develops secondary to significant atrial enlargement, as seen in conditions like dilated cardiomyopathy. (original Marciano)



"The Encyclopedia of Canine Clinical Nutrition" is an authoritative, science-based reference book published by Royal Canin that focuses on canine nutrition and its role in health and disease. Edited by leading veterinary nutrition experts, this comprehensive volume (over 500 pages) brings together current knowledge on how diet influences a dog's physiology, health, metabolism, and clinical outcomes.

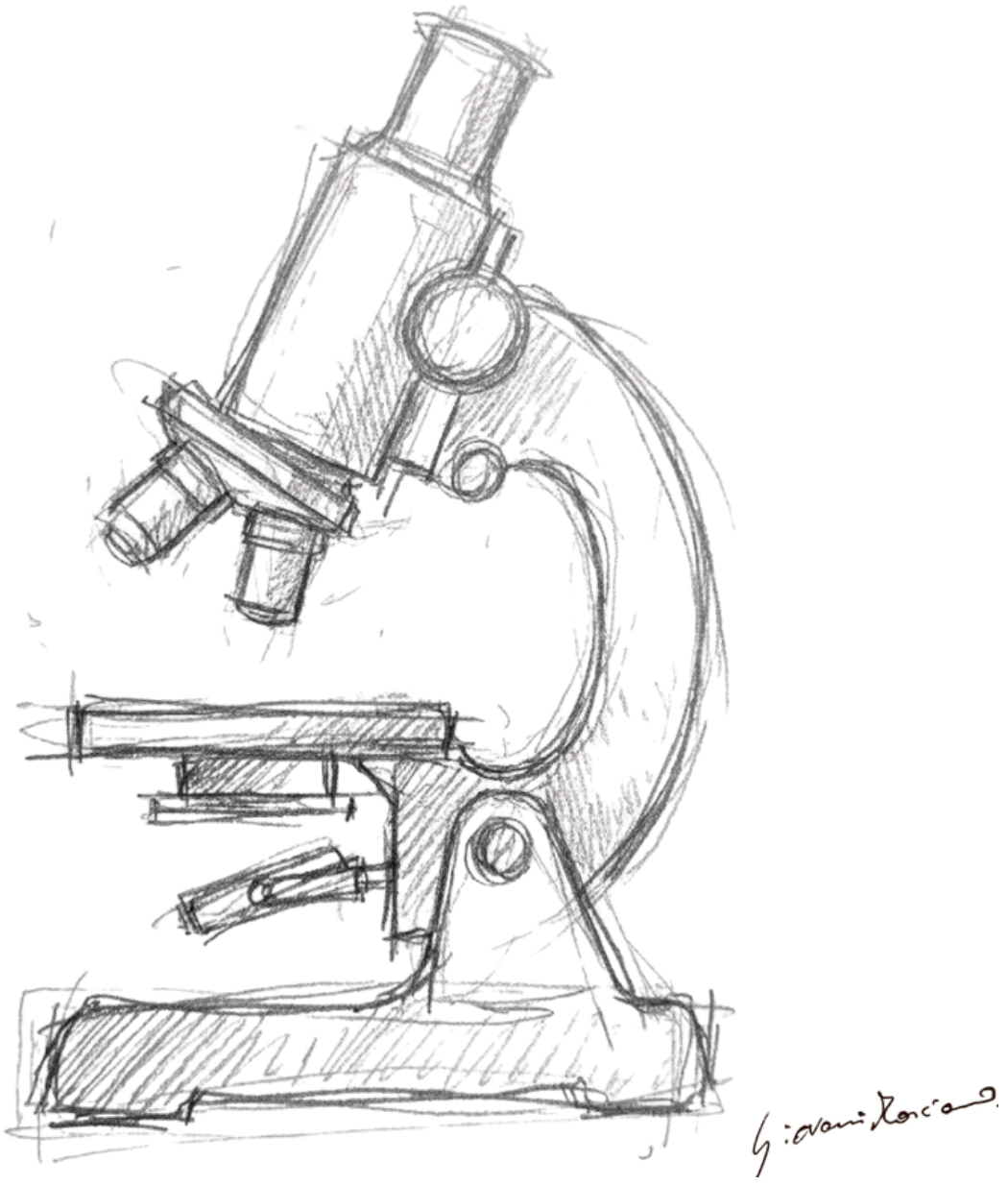
The book is designed primarily for veterinarians, veterinary nutritionists, and other animal health professionals, offering detailed chapters on topics such as nutritional needs across life stages, the pathophysiology of nutritional diseases, clinical management of conditions with dietary components, and the formulation and evaluation of diets. Each chapter is authored by experts and includes scientific evidence that links nutrition to preventive care and therapeutic strategies.

In addition to core scientific content, the encyclopedia integrates Royal Canin nutritional information—practical data and guidelines developed by Royal Canin's research teams that help clinicians apply nutritional principles in clinical practice.

Overall, this book serves as both a scientific textbook and a practical clinical resource on canine nutrition, bridging traditional veterinary science with up-to-date nutritional strategies to optimize dog health.

CHAPTER 5

SKIN HEALTH AND DERMATOLOGY IN THE NEAPOLITAN MASTIFF



Introduction

Maintaining proper hygiene in the Neapolitan Mastiff is essential for preventing skin diseases, which can be particularly challenging to treat once established. The breed's characteristic deep skin folds, heavy facial wrinkles, and abundant coat make it especially susceptible to dermatoses. These conditions involve the deeper layers of the skin, particularly the dermis, and can manifest in a variety of ways: the coat may appear dull, hair may fall out diffusely or in patches, and affected dogs often lick or scratch themselves. Etiologies are multifactorial, including nutritional imbalances, fungal infections, parasites, bacterial colonization, endocrine disorders, and environmental factors, each triggering a distinct pathophysiological mechanism.

Sebum and Skin Barrier Function

Sebum is a lipid-rich substance produced by sebaceous glands that plays a critical role in protecting the skin from external insults, such as moisture, cold, and microbial invasion. In the Neapolitan Mastiff, abnormalities in sebum production can have pronounced consequences due to their thick skin and deep folds. Hyposecretion increases susceptibility to infections, promoting pyoderma and folliculitis, whereas hypersecretion can lead to seborrhea, characterized by greasy or dry flakes on the coat. Sebum regulation is influenced by sex hormones and certain vitamin levels, particularly vitamin A. In Mastinos, hyperactive sebaceous glands are often observed in combination with other inflammatory or infectious skin conditions, worsening clinical outcomes if left unaddressed.

Seborrhea and Seborrheic Dermatitis

Seborrhea in the Neapolitan Mastiff can be classified as dry or oily. Dry seborrhea presents as a waxy, flaky coat with fine white scales adhering to the fur and skin. Greasy seborrhea produces oily, sticky hair with a characteristic rancid odor. Seborrheic dermatitis, a recurrent inflammatory disorder of keratinization, can develop secondary to primary seborrhea or other predisposing conditions. This disorder affects hair follicles and sebaceous glands, resulting in excessive sebum production, yellowish adherent scales, and sometimes alopecic patches. In Mastinos, seborrheic dermatitis is often multifactorial, involving genetic predisposition, environmental triggers, nutritional deficiencies, or secondary infections.

Primary seborrheic dermatitis, though rare in this breed, is hereditary and typically manifests in young dogs between one and two years of age. Secondary seborrheic dermatitis is more common and is frequently linked to underlying conditions such as hypothyroidism, other endocrinopathies, parasitic infestations (demodicosis, dermatophytosis, Malassezia), food allergies, or chronic otitis. Clinically, affected Mastinos often present with diffuse yellowish scaling, erythema, pruritus, folliculitis, comedones, and a musty odor due to bacterial or yeast overgrowth, particularly Malassezia pachydermatis.

Allergies and Immune-Mediated Dermatoses

The Neapolitan Mastiff may develop allergies to environmental allergens, food proteins, or medications. In such cases, the skin often appears red and inflamed. Food allergies commonly cause papules on the ventral abdomen and may contribute to recurrent otitis. Identification of specific allergens is essential for effective management. Intradermal testing can pinpoint the allergen, and desensitization therapy, either through pharmacological means or dietary modification, can help reduce clinical signs over time.

Pyoderma and Fold-Associated Dermatitis

Pyoderma is a bacterial skin infection commonly caused by Staphylococcus intermedius and often secondary to underlying dermatological or systemic conditions. In the Neapolitan Mastiff, pyoderma frequently affects skin folds where moisture, debris, and lack of air circulation create an ideal environment for bacterial proliferation. Daily hygiene combined with antiseptic application is critical for prevention. Clinically, pyoderma can range from superficial, recurrent folliculitis presenting with papules and pustules in a "moth-eaten" pattern, to deep pyoderma, which may affect the elbows, hocks, and interdigital spaces with nodular erythema, edema, and hemorrhagic dermatitis.

The breed's heavy facial folds and skin overlying joints predispose them to fold-associated dermatitis. Without early intervention, these infections may progress to chronic, painful, and recurrent pyoderma, significantly impacting the dog's quality of life.

Malassezia and Demodicosis

Malassezia pachydermatis is a lipophilic yeast normally residing on the skin, ear canals, and anal sacs of dogs. In Mastinos, overgrowth can result from immune dysregulation, excessive sebum production, or secondary bacterial infections, leading to inflammation, pruritus, and malodor. Demodicosis, caused by Demodex canis, is a parasitic condition with an inflammatory component. Although D. canis is a normal inhabitant of canine skin, overpopulation can occur due to genetic susceptibility or immune imbalance. In Mastinos, lesions may appear as early as a few days after birth, particularly on the muzzle and face, and can evolve into generalized alopecia, erythema, and secondary infections. Skin scrapings typically reveal eggs, larvae, nymphs, and adults.

Nutrition and Its Impact on Skin Health in the Neapolitan Mastiff

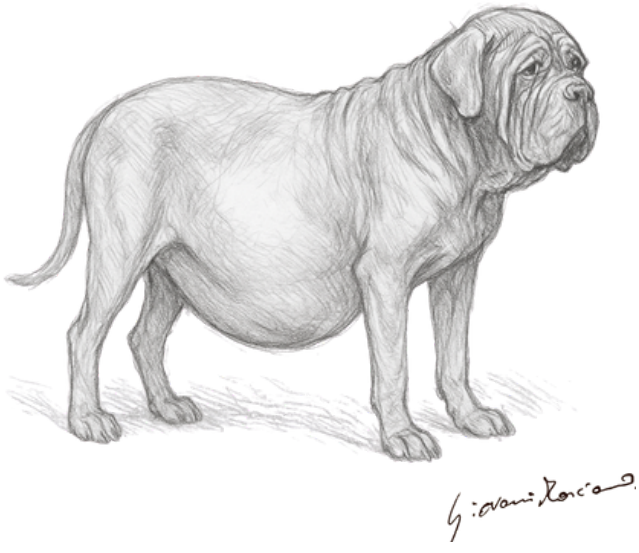
Nutrition plays a crucial role in maintaining the skin integrity of the Neapolitan Mastiff, a breed that is naturally predisposed to inflammatory and infectious dermatoses. As a giant, heavily wrinkled dog with substantial skin folds, the Mastino requires a dietary approach that supports both cutaneous barrier function and immune balance. Diets rich in high-quality proteins provide the essential amino acids needed for epidermal turnover, hair growth, and wound repair. Inadequate protein intake can lead to dull coat, impaired healing, and increased susceptibility to bacterial or yeast overgrowth. Omega-3 fatty acids—particularly EPA and DHA—offer anti-inflammatory benefits that help control chronic skin inflammation, seborrhea, and secondary pyoderma, conditions frequently encountered in this breed.

The gut–skin axis also plays a fundamental role: dysbiosis or food intolerance can exacerbate atopic tendencies, pruritus, and recurrent infections. For dogs with suspected or confirmed food allergies, hydrolyzed-protein diets or well-balanced elimination trials may significantly reduce dermatological flare-ups. Moreover, obesity—common in Mastini due to low activity levels—can aggravate skin fold infections, impair ventilation of deep wrinkles, and increase systemic inflammation. Maintaining an optimal body condition score is therefore essential not only for orthopedic health but also for preventing dermatological disease. In summary, targeted nutrition supports skin resilience, strengthens the immune defenses, and reduces the impact of chronic inflammatory skin diseases in the Neapolitan Mastiff.

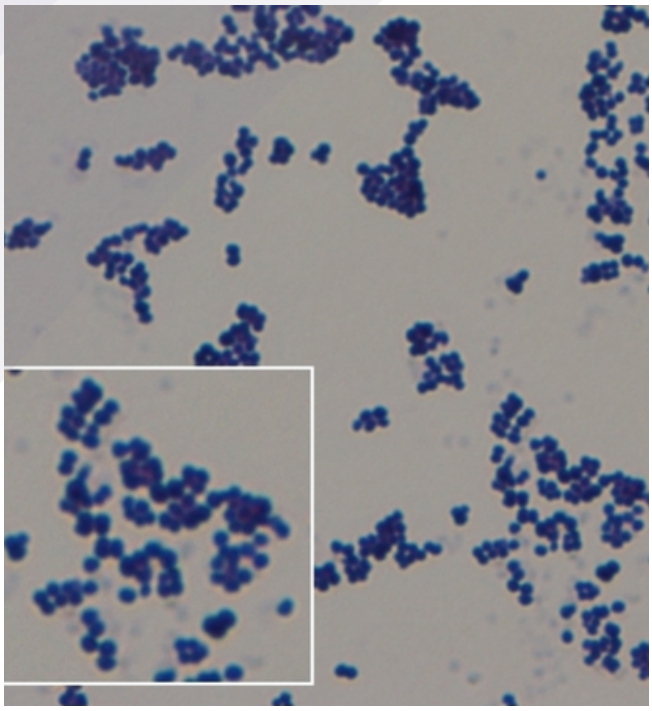
Dermatological Changes Associated with Aging

As a giant breed, the Neapolitan Mastiff experiences accelerated structural and functional changes of the skin as it ages. The reduced elasticity of the dermis, progressive weakening of the skin barrier, and a natural decline in immune efficiency make senior Mastini particularly prone to recurrent infections such as pyoderma, otitis externa, and seborrheic disorders. The already heavy and abundant skin folds tend to become deeper and more difficult to manage in older dogs, increasing moisture retention and friction. This predisposes geriatric Mastini to chronic intertrigo, pressure sores, hyperkeratosis of weight-bearing areas, and delayed wound healing.

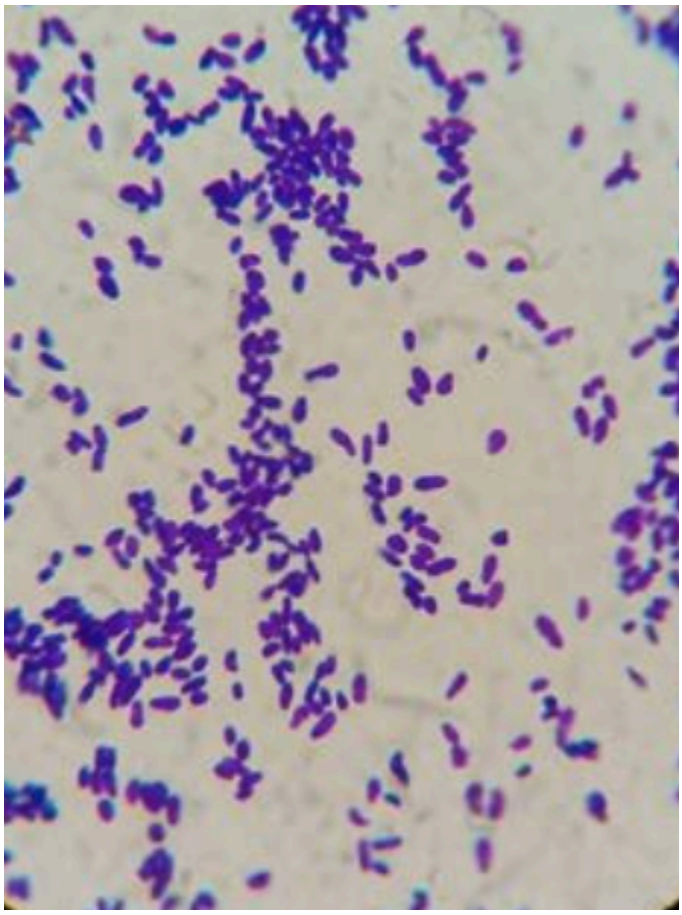
Furthermore, senior individuals often suffer from concurrent endocrine disorders—such as hypothyroidism or Cushing's syndrome—that can intensify dermatological symptoms, including alopecia, scaling, and increased susceptibility to bacteria and yeast. Age-related mobility decline reduces the dog's ability to groom itself, further contributing to poor coat condition and localized infections. For these reasons, dermatological monitoring becomes increasingly important in the aging Mastino, with emphasis on controlling inflammation, maintaining optimal nutrition, and adjusting hygiene routines to compensate for the progressive weakening of the skin's natural defenses.



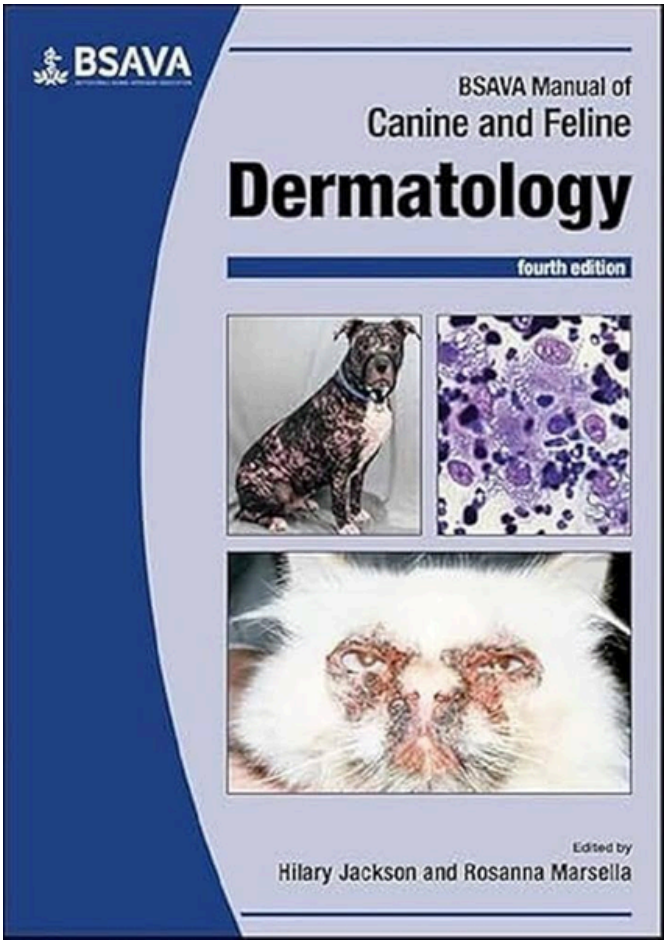
A senior Neapolitan Mastiff with a markedly rounded abdomen, evident muscle thinning along the limbs and topline, and patchy hair loss over the belly. These age-related and metabolic changes highlight the chronic, progressive nature of systemic endocrine imbalance in elderly dogs. (original Marciano)



Staphylococcus intermedius micrograph. Smear made from a liquid culture (tryptic soy broth, Oxoid).
Morphology: Gram-positive cocci in clusters.
Source: www.microbiologyinpictures.com



Microscopic morphology of Malassezia pachydermatis (Gram staining)
Source: www.researchgate.net



"BSAVA Manual of Canine and Feline Dermatology"– A practical, comprehensive guide to the diagnosis and management of skin diseases in dogs and cats. Covers common and complex dermatological conditions, with clinical tips, illustrations, and treatment protocols, widely used by veterinarians worldwide.

Gross morphology of Malassezia pachydermatis (original Marciano)

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Preserving the Legacy of the Neapolitan Mastiff

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Through responsible breeding practices and owner education, the USNMC is committed to:

- Preserving the breed's historical type and temperament
- Promoting health testing and ethical breeding standards
- Supporting new owners with training and care guidance
- Encouraging responsible guardianship of giant-breed dogs

Whether you are a breeder, owner, or admirer, the USNMC works to ensure that the Neapolitan Mastiff continues to thrive for future generations.

Source: www.akc.org/dog-breeds/neapolitan-mastiff/

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