Necrotizing fasciitis in amputated tail

Great Dane   Female   4 years old

"**Day 0**" equals first day of MPPT treatment

This 4-year-old, female, Great Dane had previously suffered from "happy tail" injuries but had always healed spontaneously. She was fit and healthy with no known health concerns. This time, the injury refused to heal (pic 1). Topical antibiotic, Mupirocin Ointment 2%, was used. The tip of the tail died off (pic 2). The end of the tail was amputated 7 weeks later and bandaged. Upon inspection 3 days later, the tail was extremely red and painful. Possibly, the infection had spread further, hidden from sight, in cranial direction than anticipated with the amputation potentially failing to remove the most advanced part. After another 3 days with bandage, the tail had deteriorated further (pic 3). Cefpodoxime systemic antibiotics, Simplicef 200 mg 2xdaily, were prescribed. The stitches soon ruptured leaving the tail bone visible at the end of the tail (pic 4). An approximately 6 cm wide band of black, necrotizing skin was girdling the tail full circle starting approximately 3 cm from the amputated tip. The 3 cm area between the dehisced stump and the necrotic band was swollen, red, hot, and oozing (pic 5). The stump was swollen and discharging necrotic debris (pic 6). The dog was continued on Cefpodoxime despite the resistant nature of the infection. The vet recommended a second amputation cranially to the necrotic part suggesting the use of a different post-op bandaging technique. The owner hesitated, as the out-of-sight rapidly moving infection could possibly already have advanced cranially beyond the suggested novel site of amputation reaching critically close to the trunk with no signs of the antibiotics stopping this advancement.

The infection progressed with the typical characteristics of a necrotizing fasciitis, shredding the dry, thick, dead skin and rapidly consuming the underlying tissues while spreading in all directions, with sidewise being the most easily detectable (pic 7, 8, 9, 10). It consumed large portions of the muscles and soon involved nerve fascicles and ligaments. (pic 11, 12, 13, 14, 15, 16, 17, 18). MPPT treatment was started, but the systemic antibiotics were only stopped 1½ days later. Whereas the antibiotics slowed down the initial recovery process, it quickly sped up following their discontinuation (pic 19, 20, 21, 22, 48, 49).
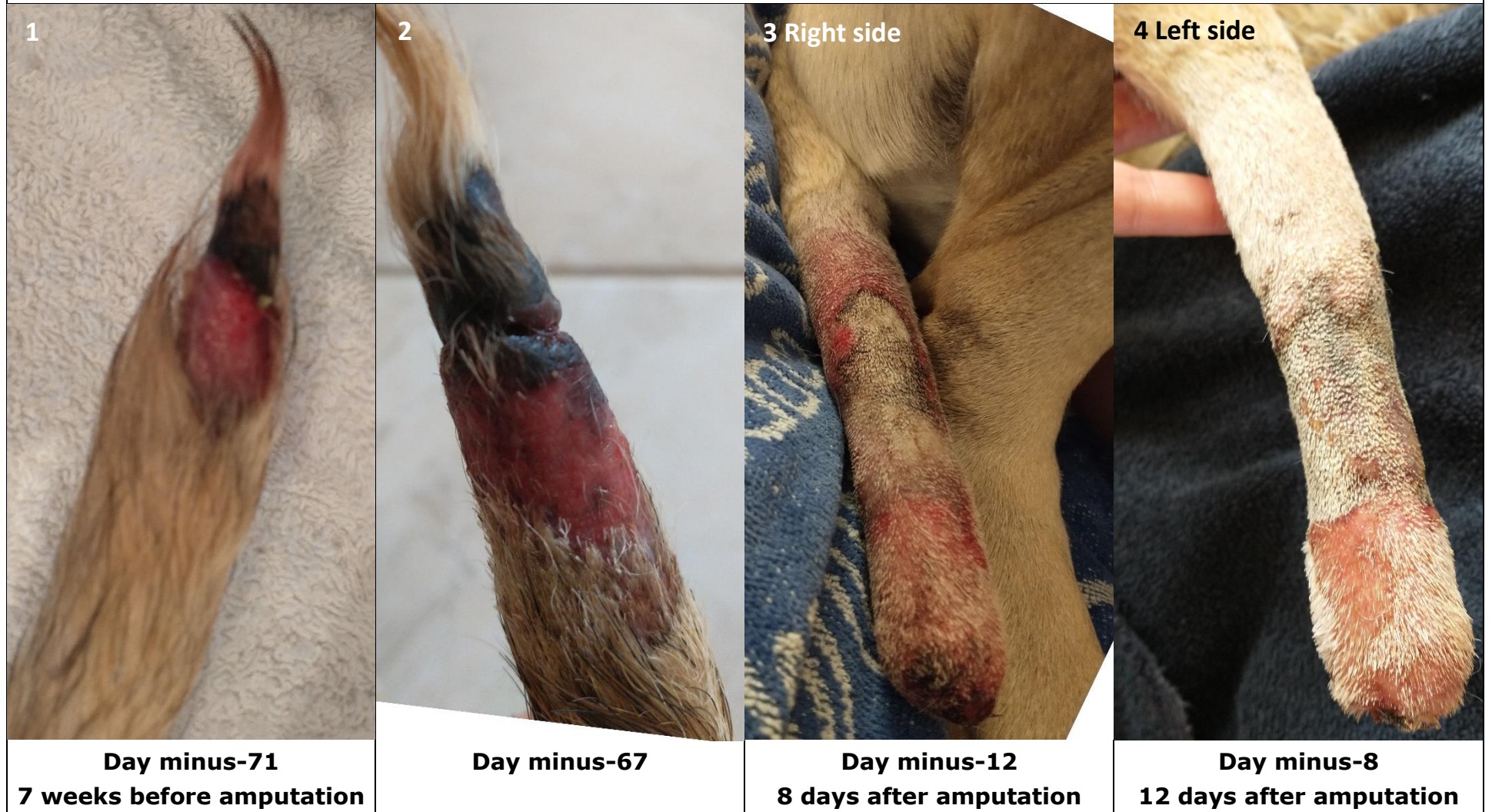
The dorsal nerve plexus of the tail, Plexus caudalis dorsalis, runs between the tail lifters, Mm. sacrocaudalis dorsalis medialis & lateralis, and the deep side pullers, Mm. intertransversarii dorsales caudae, accompanied by the corresponding caudal arteries, Aa. cauldales. The anatomy of the ventral side of the tail is largely similar, except that the nerve plexus runs nearer to the bone.

A portion of the lifter muscles with all accompanying structures had disappeared and the deep side pullers were heavily affected with parts missing. The dorsal nerve plexus sandwiched between these muscles had suffered greatly. All 5 dorsal nerve fascicles were exposed. Some of the fascicles were severed and others had lost both their tension and their characteristic round shape. Dried, coagulated blood in between the fascicles (before washing) showed that the accompanying vascular network was also affected. (pic 11, 12, 13, 15, 16, 17). A similar scenario was developing on the ventral side of the tail. Here, the nerval plexus runs slightly deeper, i.e. closer to the bone, and only two nerve fascicles were visible. These seemed not to have suffered nearly as much. (pic 18).

The spread of the infection was quickly halted. The soft tissue was cleared of debris, including from underneath the nerve plexus (pic 19, 20). In parallel granulation stated filling in the missing soft tissue and epithelialisation occurred along all wound edges (pic 19, 20, 21, 22, 48, 49, 50, 51). As this process progressed, the nerve fascicles gradually recovered and were covered with new soft tissue (pic 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34).

One months after start of MPPT (Day 32) the stump had fully epithelialized and all nerve fascicles were fully covered with granulation (pic 35, 36, 37,38, 53). The MPPT treatment was deemed no longer needed and, in line with a few applications having been omitted lately, the last application was the following day, i.e. Day 33.

By this time, the epithelialisation had already advanced very far from both ends and pigmentation was being re-established as this novel skin matured (pic 35, 36, 37, 38). The wound progressed to closure at a pace corresponding to the severity of the initial damage of the respective area and had closed completely 7 weeks after start (pic 39, 40, 41, 42). As the new epithelium matured, pigmentation was restored and hair follicles would regenerate in parts of both the cranial and distal end of the circular girdle, but a band remained without hair (pic 39, 40, 41, 42, 53). The dog lived in a warm, sunny climate with extensive exposure to the sun, and a follow-up at mid-summer, 10 weeks after full closure, showed a tail with fully functioning protecting pigmentation and with no limitations to its ability of movement. The dog was reported to show no signs of being bothered by the tail, as would be expected in case of pain. A band remained without hair regrowth (pic 43, 44, 45, 46, 54).

1

Day minus-71

7 weeks before amputation

2

Day minus-67

3 Right side

Day minus-12

8 days after amputation

4 Left side

Day minus-8

12 days after amputation

	6½ weeks before amputation	**1½ weeks before first MPPT**	**1 week before first MPPT**
Tip of the tail is necrotizing.	The necrotic tip is breaking off on its own accord and the infection is spreading cranially up the tail.	The stitches are still intact but the sutured area is necrotising black and inflamed red. The necrotizing infection is rapidly spreading proximally towards the dog's trunk.	The stitches from the amputation have ruptured on their own accord.

5 Right side

6 Stump

Day minus-6 **14 days after amputation** **1 week before first MPPT** The necrotizing fasciitis is spreading. The distal 3 cm closest to the amputation site are swollen, red, hot and oozing. The following black band of necrotic skin is extending in cranial direction.	**Day minus-6** **14 days after amputation** **1 week before first MPPT** Necrotic debris is seeping from the amputation site. Pronounced swelling

7 Dorsal

8 Left side

9 Right side

12.02.2022 ventral view not available

10 Stump

| **Day minus-2** | **Day minus-2** | **Day minus-2** | **Day minus-2** |

The necrotic skin is lifting and falling off on its own accord

11 Dorsal	12 Left side	13 Right side	
			14.02.2022 ventral view not available
			14 Stump
Day 0 **Before wash**	**Day 0** **Before wash**	**Day 0** **Before wash**	**Day 0**
10 – 20 mm of all 5 caudal nerve fascicles are visible – 2 are broken. All overlying soft tissue has disappeared and the muscles underneath them is also disappearing. The vascular network is affected. *Yellow arrows*: Broken, dried nerve fascicles *Blue arrow*: Oozing from the infection.			*Green arrow:* White exposed, amputated bone.
DORSAL	*LEFT SIDE*	*RIGHT SIDE*	*VENTRAL*

15 Dorsal	**16 Left**	**17 Right**	**18 Ventral**
Day 0 **After wash** **Just before first MPPT**	**Day 0** **After wash** **Just before first MPPT**	**Day 0** **After wash** **Just before first MPPT**	**Day 0** **After wash** **Just before first MPPT**
10 – 20 mm of all 5 dorsal caudal nerve fascicles are visible. They are all severely affected – 2 are broken. All overlying soft tissue has disappeared and the muscles underneath them is also disappearing. Nerve fascicles are not manipulated.	The thickness of the tail is vastly reduced.	Two broken nerve fascicles from the dorsal plexus are dangling.	*Yellow arrows*: two nerve fascicles from the ventral plexus. *Blue arrow*: The oozing from the infection has reappeared very shortly after washing

19 Dorsal

20 Left

21 Right

22 Ventral

Day 3	Day 2	Day 4	Day 4

The soft tissue underneath the nerve plexus is being cleared of infection and cleaned up. The resulting debris is being pushed out between the nerve fascicles.

Nerve fascicles have not been manipulated. They are now all in the right place and being covered with granulation tissue from both ends and both sides.

White arrow: a hole showing the hollow underneath the nerve plexus.

Red arrows: Islands of emerging epithelialisation.

Systemic antibiotics were only discontinued 12 hours prior.

All wound edges are healthy, whitish-grey, and epithelializing

Yellow arrows: Nerve fascicle

23 Dorsal	24 Left	25 Right	26 Ventral
Day 11	**Day 11**	**Day 11**	**Day 10** *Yellow arrow*: Nerve fascicles

27 Dorsal Day 14	**28 Left** Day 13	**29 Right** Day 14	**30 Ventral** Day 13
Yellow arrows: Still visible nerve fascicles			Last bit of visible nerve fascicle.

| **Day 21** | **Day 21** | **Day 21** | **Day 21** |

Yellow arrows: Last remaining visible bit of the nerve fascicles

35 Dorsal | **36 Left** | **37 Right** | **38 Ventral**

Day 32 | **Day 32** | **Day 32** | **Day 32**

All infection is gone. The stump has closed (pic 53). The following day, Day 33, is the last of MPPT application.

39 Dorsal — **Day 48** — **Full closure**

40 Left — **Day 44** — **Left side closure**

41 Right — **Day 40** — **Right side closure**

42 Ventral — **Day 35** — **Ventral closure**

Pigmentation is being restored as the new skin matures. Hair follicles are regenerating in both ends of the girdle and on the amputation stump.

43 Dorsal

44 Left

45 Right

46 Ventral
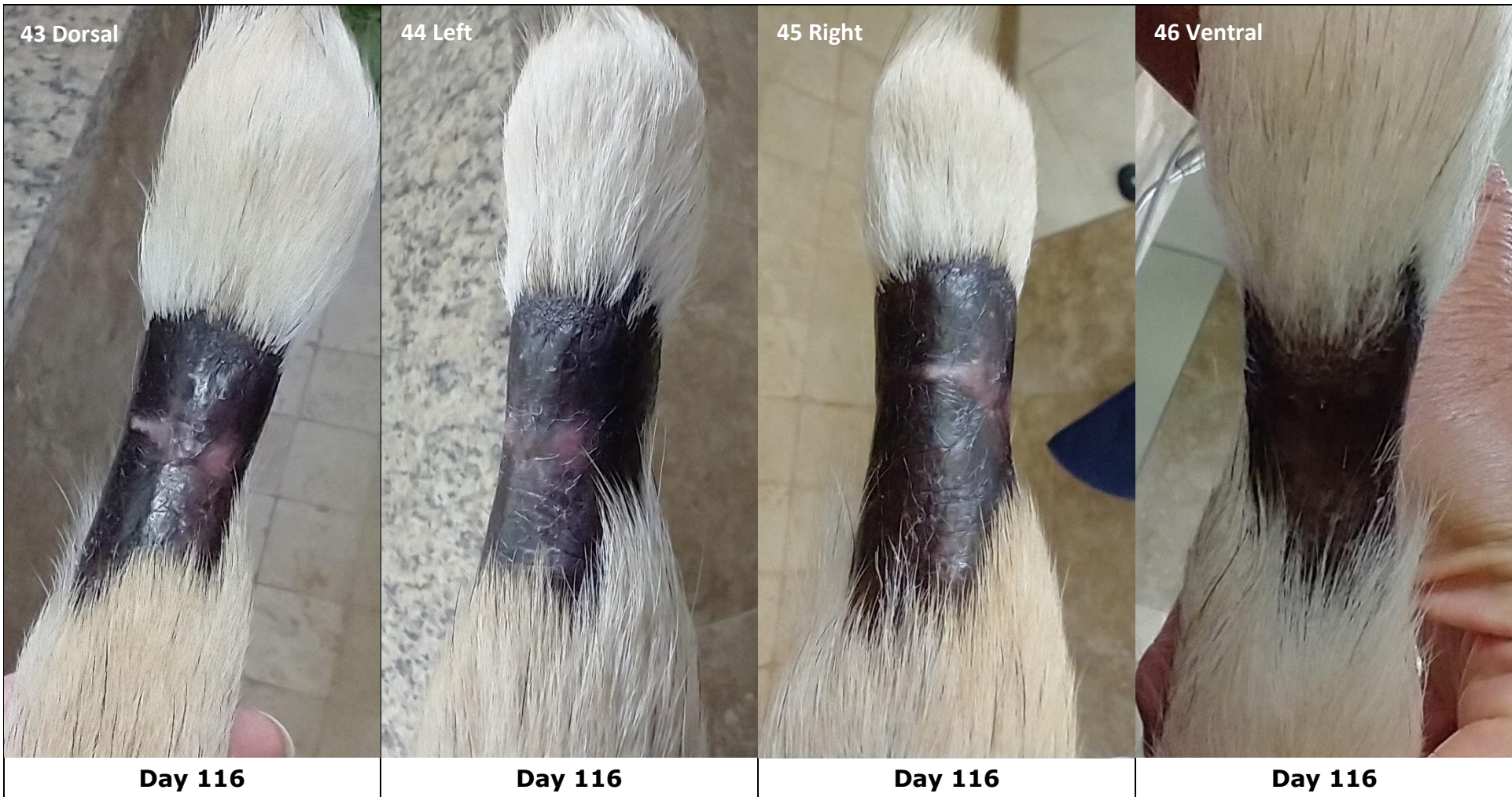
Day 116 | **Day 116** | **Day 116** | **Day 116**

Follow-up

Follow-up 10 weeks after full closure. Pigmentation has been practically fully restored and its present dark tan in the middle of summer shows that it is working and protecting properly as the dog lived in a warm, sunny climate.

Day 0

Amputated bone is exposed in the centre of the dehisced, highly infected, swollen, stump.

Day 2

Infection is being controlled and debris disposed of. The amputated end of the bone is clean and ready for granulation to cover it. Entire edge is epithelializing.

Progress is despite systemic antibiotics only being discontinued 12 hours prior.

Day 6

Granulation has covered the end of the bone. The edges are epithelializing rapidly.

Dark debris is still being pushed out past the newly generated granulation tissue.

Day 11

Granulation has built up a substantial amount of soft tissue cushioning and protecting the end of the amputated bone. See Day 12 (pic 51) for side view.

The epithelialisation is advanced. Infectious debris continues to be released in small amounts.

Day 12

Granulation has built up a substantial amount of soft tissue which will serve as cushioning and future protection of

Day 15

Healing is well advanced. Infection debris is still being released through the

Day 32
Closure

The infection is fully removed, and the stump has progressed to full closure.

Day 76
Follow-up

Dark pigmented skin is detectable underneath the well haired stump.

| the amputated bone. Epithelialisation is well underway.

See Day 11 for end view.	opening, and it is therefore too early for full closure.	The following day will be the last day of MPPT treatment.	