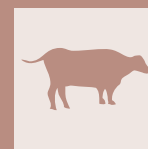


# Conservative management of a distal interphalangeal joint dislocation of dairy cow in field, radiographic findings and thermography: case report



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## SUMMARY

The painful nature of lameness makes it a serious welfare issue. Early detection and management of lameness is paramount. In the present case report, a 20-months-old dairy cow was referred with a history of acute lameness (locomotion score 5, on a scale of 5-point). Infrared thermography was used as a useful addition to the diagnostic tools available to clinicians, as it can detect localised variations in temperature and have a great potential to assist diagnosis in bovine lameness. The evaluation of subtle temperature variation associated with inflammatory conditions is a very important indicator to detect inflammation associated with lameness. In this case, the use of the preclinical thermographic examination was capable of pinpointing the location in the area of the greatest inflammation to focus radiographs. Following this procedure, physical and radiographic examinations were taken of the detected area and were evaluated. A non-weight bearing lameness of the right forelimb and a swelling medial hoof that was painful upon palpation was noticed. Radiographic images showed a dislocation of the distal interphalangeal. Conservative management was performed by placing the healthy claw on a block to alleviate weight bearing on the affected claw and the half-limb cast was used for immobilization of phalangeal for 25 days. Complete joint ankylosis was evident on radiographs, one month after. Effectiveness of all treatment measures was monitored through continual locomotion scoring. Clinical outcome was excellent. The management of lameness is centred on improving the welfare of the cow. Although the function of the ankylosed digit is reduced, it still plays a part in bearing weight; movement at pasture and on slatted floors remains satisfactory. The advantages of a conservative approach and a clinical management, if there are adequate conditions, allow to salvage the digit which a long productive life can still be expected, reduce costs for the owner and avoid complications after surgery.

## KEY WORDS

Cow, lameness, distal interphalangeal joint dislocation, thermography, radiography.

## CASE HISTORY

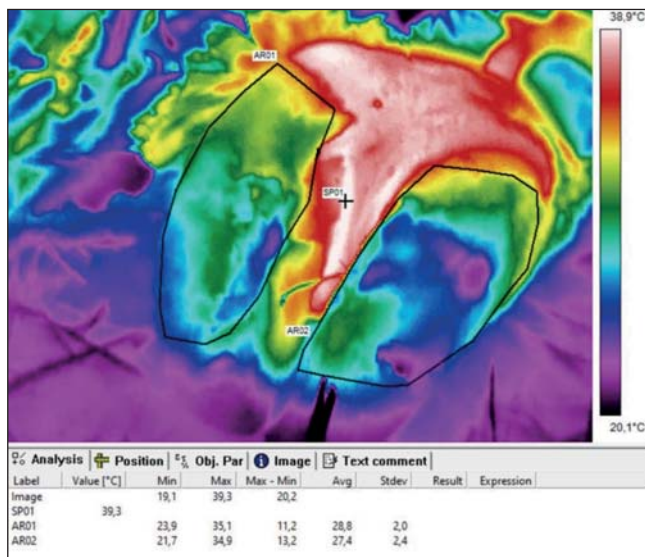
Lameness in cattle is considered to be a major welfare<sup>1</sup> and economic problem of the dairy industry globally. The economic impact of lameness is due to lose in terms of milk production loss, lower fertility and increased risk of culling<sup>2,3,4</sup>. Approximately 90% of the causes of lameness involve foot lesions<sup>5</sup>. Lame animals may be subject to pain that has the potential to become chronic, especially if lameness remains undetected for long periods of time<sup>6</sup>. Early and accurate detection is paramount and allows for appropriate treatment of the lame animal increasing the chances of restoring the performance of the cow<sup>7</sup>. However, it has been reported that, about 25% to 50% of lameness conditions go unnoticed by dairy farmers and veterinarians lacking expertise in this field<sup>1</sup>. This causes a delay or complete lack of treatment of affected animals. This progress to subsequently cause an infection of the bone, synovial structures, tendons and ligaments of the digit<sup>8</sup>. Reliable, practical and non-invasive methods to frequently and rapidly screen in real time for the presence of diseases at the foot and cow level are needed. One of the diagnostic methods of bone and joint lesions for lame-

ness is radiography. Radiographic examination is often necessary and in most cases, useful to reach to a diagnosis<sup>9,10,11</sup>. A more recent technique referred to as Digital Infrared Thermal Imaging, also known as Infrared thermography (IRT) involves, a non-invasive quantitative diagnostic tool that measures surface temperature of an object and produces it in a thermal colour map. This technique, which helps to evaluate inflammatory changes noninvasively, is especially useful for lameness diagnosis and to localize lesions. For this reason, it should be used for early pre-clinical control. Some studies used digital infrared thermography as a non-invasive, early diagnostic tool for foot pathologies in dairy cattle. They concluded that this technique is reliable in detecting elevated temperatures associated with foot lesions<sup>12,13</sup>.

A 450 kg, 20 months old, Simmental cross cow was referred to the Preventive Medicine Service and Breeding Clinic of the Veterinary Teaching Hospital of University of Padua with an history of acute lameness. The dairy cow was severely lame with a locomotion score of 5 (on a scale of 1 to 5)<sup>14</sup> of the right front limb of less 5 days in duration. The cow was managed on an intensive system with slatted floor. Before the physical exam, the infrared thermography was used to aid in defining the localization area of increased inflammation and/or injury. The thermograms were generated using an infrared thermographic imager (ThermaCAM FLIR-T420, Flir Systems,

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**Figure 1** - Infrared Thermal image of front foot of the dairy cow with the areas of interest: SP01, interdigital area ( $T^{\circ}$ - 39.3°C); AR01, medial claw ( $T^{\circ}$ -AGV 28.8°C); AR02, lateral claw ( $T^{\circ}$ -AGV 27.4°C). (colors of temperatures are indicated on the lateral bar)

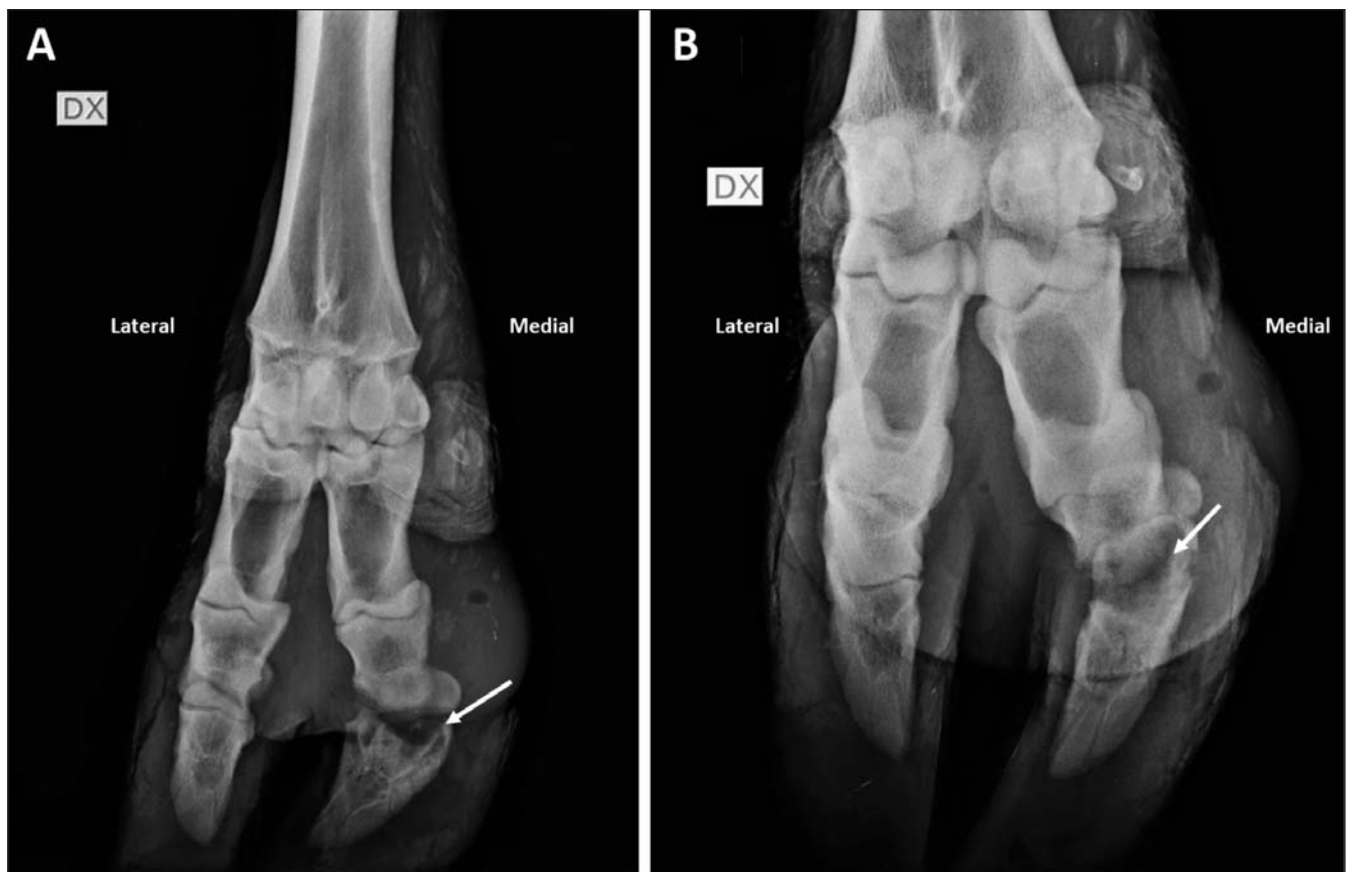
Boston, MA, USA). The images were processed using the ThermoCAM Researcher software (FLIR Systems, Wilsonville, OR, USA). IRT showed a higher temperature at the level of the medial claw of the front right foot ( $T^{\circ}$ -AGV 28.8°C) by comparison with the lateral claw ( $T^{\circ}$ -AGV 27.4°C); furthermore, the

medial interdigital area (SP01) showed a surface temperature of up to 39.3°C (Fig. 1).

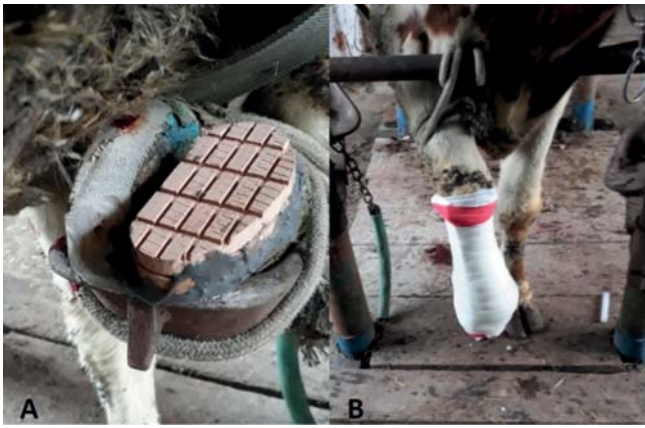
The animal was bright and alert, the internal temperature of 38.5°C and a pulse of 80 beats/minute. Physical examination revealed swelling and pain in the hoof area. There were no external skin wounds.

Radiographic examinations were performed with portable radiographic equipment AJEX Meditec© (140 H)<sup>15,16</sup> and radiographic films of dimensions 18cm x 24cm. The projections used were dorsopalmar and dorsal 65° proximo-palmarodistal oblique views, in order to observe the condition of the interphalangeal joints and the metacarpal phalangeal joint (Fig. 2). The radiographic technique used for this region was 6.4 mAs and 55 kV exposure. Radiographic images revealed evidence of a dislocation, also called luxation, with angulation of the medial distal interphalangeal joint and widening of the joint space. A distinct circumferential soft tissue swelling is present from the level of the medial metatarsophalangeal to the medial distal interphalangeal joint.

Diseases process of the distal interphalangeal joint and distal phalanx are a common source of lameness in cattle that may be life limiting. Diseases affecting the distal interphalangeal joint and/or the phalanges include septic and non-septic arthritis, luxations, septic and nonseptic pedal osteitis, and fractures<sup>17</sup>. Common reported therapeutic options include radical surgical treatment by digital amputation and resection of the distal interphalangeal joint, or a conservative management by placing the healthy claw on a block to alleviate weight bearing on



**Figure 2** - Radiographic images (A:dorsopalmar; B: dorsopalmar oblique) of the right front fetlock and foot obtained standing with the cow bearing weight on its leg. Dislocation (Luxation), angulation and widening of the joint space at the medial distal interphalangeal joint (arrow). A distinct circumferential soft tissue swelling from the level of the medial metatarsophalangeal to the medial distal interphalangeal joint is present.



**Figure 3** - A) Claw block glued to sole surface and hoof wall of the healthy digit to allow limited weight-bearing on injured digit. B) Low-limb cast applied from the sole surface distally up to the midmetacarpus proximally for stabilization of the dislocation of the distal interphalangeal joint.

the affected claw, facilitated ankylosis<sup>17</sup>, and fenestration of the abaxial hoof wall, and implantation of gentamicin-impregnated collagen sponges<sup>18</sup>.

In this case, a conservative approach was selected based on the experience of the veterinarian, the behavioural nature of the animal, the absence of signs of bone or tissue infection and, therefore, in agreement with the owner the cheapest solution was chosen. Therefore, a curative and corrective trimming of claws was made to the affected limb and the sound claw was elevated by applying a “therapeutic” block to the sole of the healthy digit (3.5 in height and formed to the size and shape of the healthy hoof) to relieve the weight bearing from the affected claw altogether (Fig. 3). This provided both pain relief and aids in healing. The cow was treated topically with 10 g of antibiotic dust (sulfanilamide, sulfaguanidine, benzylpenicillin

sodium, chlortetracycline hydrochloride) and intravenously with 1.1 mg/kg of flunixin meglumine.

Half-limb cast (also called low-limb cast or short cast) a synthetic plaster type Delta-Lite \* Plus was used for immobilization of phalangeal joint (Fig. 3). The cast was placed from a point immediately distal to the carpus extending to the ground and encasing the foot and was kept for 25 days. The cast immediately allowed the cow a fair support of the limb. At the time of the removal, a slight medial swelling persists, the likely outcome of the pseudo-arthritis formed. A light bandage was practiced to keep for a few days. The cow, although without any rigid support, showed almost total support of the affected limb with mildly lame and a locomotion score of 2 (on a scale of 1 to 5)<sup>14</sup>.

A new radiographic evaluation was performed 40 days after dislocation. The dorsopalmar oblique view showed a complete joint ankylosis has taken place in the distal interphalangeal joint (Fig. 4).

Thorough examination and use of appropriate diagnostics including radiography and thermography should help in reaching a diagnosis. Early identification of lameness will help in early treatment and management of the cause of the injury. The management of lameness is centred on improving the welfare of the cow. Diseases of the distal interphalangeal joint were commonly treated by amputation of the affected digit. However, with only a single digit on one foot, the animal can no longer be kept in accommodation with a slatted floor, walking on pasture is difficult and the remaining digit has to bear extra weight, with an increased risk of it becoming diseased, especially in heavy cows and bulls, with fatal consequences. Although the function of the ankylosed digit is reduced, it still plays a part in bearing weight; movement at pasture and on slatted floors remains satisfactory. These advantages make a conservative approach and a clinical management a more suitable technique to apply to valuable animals or to those from which a long productive life can still be expected. If successful, the procedure allows a cow to have several more lactations and is therefore economical whether it is carried out during or at the end of a lactation.

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**Figure 4** - Dorsopalmar oblique view 30 days after clinical management showed a complete joint ankylosis of the medial distal interphalangeal joint.

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