

BLACK GRAM GUM BANDAGE FOR EXTERNAL IMMOBILISATION OF FRACTURE OF METACARPUS IN CALVES

Kalyani Biswas and K.N.M. Nayar

Department of Surgery

College of Veterinary and Animal Sciences, Mannuthy, Thrissur - 680 651

External immobilisation using Plaster of Paris is still the most commonly adopted technique in large animal orthopaedics, though it is not without complications. The heavy weight and size of the adult patient, cost of the treatment and rehabilitation of the animal after treatment are deterrants faced by the field veterinarians in adopting the newer orthopaedic procedures in large animals. The major drawback of Plaster of Paris is that it becomes moist and soft and then it does not support the body weight. Sahay and Khan (1976) have used self polymerising acrylic agents for external unimobilisation with trans-fixed Steinmann pins. Tulleners (1986) treated 22 metacarpal and 11 metatarsal fractures in cattle using felt orthopaedic padding, metal splints and polyurethane resin fibre glass or resin impregnated Plaster of Paris cast. The available reports reveal that investigations to find a suitable substitute to Plaster of Paris cast have not been very successful.

The present study was undertaken to find out a substitute for Plaster of Paris cast with materials readily available.

Materials and methods

Six male calves aged between six to twelve months and weighing approximately 50 to 80 kg were used for the study. The animals were kept under observation for a

week prior to the experiment. Blood and dung samples were examined and they were dewormed and maintained under identical conditions of feeding and management.

The animals were prepared by withholding feed for 24 hours and water for 12 hours prior to the experiment. Ring block was induced using 10 millilitres of a two per cent solution of lidocaine hydrochloride, infiltrated subcutaneously, just below the knee. An incision six centimeters long was made at the midshaft region on the antero-lateral aspect of the metacarpal, cutting through the skin and subcutaneous fascia to expose the bone. Using a sterilised saw, the bone was cut through half its thickness and then broken manually to create the fracture. The skin wound was sutured and bandaged.

The fracture was reduced and the limb immobilised with the application of splints and bandage impregnated with gum prepared afresh with the following ingredients:

1. Black gram powder : 125.0 g
2. Rock salt : 12.5 g
3. Papada Karam : 6.25 g
4. Water : 25.0 ml
5. Egg white : 12.0 ml
6. Lime juice : 5.0 ml

A dough prepared by mixing black gram powder and the supernatant fluid from the mixture of papadakaram, rock salt and water, was procured locally. The egg white and lime juice were added to the dough and it was kneaded to prepare the gum.

Padded bamboo splints were applied around the metacarpal region and were secured in position using tape. The splints were covered with a bandage and a thick layer of freshly prepared gum was applied over the bandage. Two layers of bandages and gum were applied alternately one over the other and the cast was allowed to dry. The cast extended from just above the knee to below the fetlock.

Postoperative care:

The animals were kept under observation for periods upto six weeks. One calf was sacrificed at two weeks, another at four weeks and the remaining animals on completing six weeks. The immobilising bandage was maintained throughout the period of observation. Penicillin (10 lakhs) and streptomycin (1.25 g) combination was administered intramuscularly for five consecutive days to all the calves. Neem oil was applied over the cast to ward off flies.

The following observations were recorded.

1. Clinical symptoms, efficacy of immobilisation, functional status of the limb and immobilising dressing.
2. Radiographic evaluation of the progress of healing at weekly intervals.
3. Macroscopic study of the bone and histological study of the callus.

Results and discussion

The clinical signs observed included favouring of the limb, pointing of the toes, dragging of the toes and oedema. Three animals favoured the limb throughout the period of observation. Pointing of the toes was noticed only in one animal. Dragging of the toes was noticed in three animals. Oedema distal to the cast was observed in two animals in the fourth and fifth week and it subsided when the pressure of the cast was relieved. Oedema, distal and proximal to the plaster cast/immobilising dressing in the treatment of fracture has been reported by Leonard (1960) and Fessler and Amstutz (1974).

The cast became hard, firm and dry and gave adequate support for immobilisation. It remained intact during the period of observation in three animals and had to be changed once in the other three animals.

Radiographic studies revealed radiodense areas in four animals in the second week, five animals in the third week and in all six animals by the fourth week. Singh (1978) reported periosteal reaction in both segments of the bone by the second week when simple coaptation with Plaster of Paris cast and aluminium strips were used. Singh and Nigam (1979) observed slight periosteal reaction and blurring of the fracture gap by the second week and periosteal bone formation with moderate periosteal reaction by the fourth week in simple coaptation. The fracture line had become less distinct in one animal in the third week and two animals in the fourth week. Ossification of the callus was evident by the fourth week in all the animals. Union of the fragments was noticed in five animals in the fifth week. Partial obliteration of the fracture line was observed in five animals in

the fifth week. The callus was continuous between the fragments in five animals in the sixth week. These observations are in agreement with the observations of Singh (1978) and Singh and Nigam (1979). Partial displacement of the fragments was observed in four out of the six animals at the sixth week. Ayyappan (1981) observed displacement of fragments when Plaster of Paris reinforced with bamboo splints were used for immobilisation in fracture of tibia in calves. Similar observations were made by Singh *et al.* (1984) and Rao *et al.* (1985).

Well developed callus and union of fragments was seen in five out six animals in the sixth week. The bone cropped at two weeks showed a blood clot between the two fragments which were in opposition but the fragments showed restricted mobility. At four weeks, soft callus at the fracture site was well developed and mobility was restricted. In the animals kept for six weeks, the callus was well developed, suggestive of clinical union with no mobility at the fracture site except in one animal where the callus was well developed but there was no clinical union.

Microscopic examination of the callus cropped at the second week revealed proliferative changes of periosteum and connective tissue with inflammatory reaction characterised by cellular infiltration. Zones of ossification close to the cortical bone were observed. At the fourth week, zones of ossification, fibrous tissue proliferation and vascular proliferation were observed in the callus along with inflammatory reaction. At six weeks, the callus revealed proliferating, highly vascular connective tissue along with trabecular ossification centres. The trabeculae were continuous with the cortical bone.

The callus resembled cancellous bone. In one animal, there were zones of suppuration and the callus contained large areas of connective tissue with scattered zones of ossification.

Suppuration at the suture line extending upto the callus was observed in one animal. Hamilton and Tulleners (1980) and Singh *et al.* (1984) have reported infection and malalignment as the most common post operative complications after external and internal immobilisation of fracture in animals.

Summary

Metacarpal fracture healing was studied in six healthy male calves using an immobilising cast of freshly prepared black gram gum and bandages. The gum bandage formed a cast which was hard, firm and dry and remained in position for six weeks. Healing was observed to be satisfactory and bone union was noticed in all but one animal. The cast was light in weight and could be easily prepared with readily available local materials.

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