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An Evaluation Of Clinical Data On Intramedullary Pinning In Dogs

Thomas J. Flynn — V.M. 4

A STUDY of the records of the Stange Memorial Clinic at Iowa State College for the years 1948–49 shows a total of 27 cases of fractures of the long bones in dogs in which the technic of intramedullary pinning was employed therapeutically. The purpose of this article is to list these cases, to note the results obtained, and to draw some conclusions from these results. The technic of the operation does not fall within the scope of this article, except where variations therefrom warrant mention. For these readers not familiar with the operation as done at this institution, the reading of detailed case reports published in this and preceding issues of this publication is recommended.

The first case recorded on the clinical records was entered on Sept. 25, 1948. It and subsequent cases are listed in chronological order. Normal hospital procedures and post-operative care are not mentioned for the sake of brevity.

Case No. 1. A 5-year-old male, black Shepherd was admitted on Sept. 25, 1948, with a history of having broken its right hind leg that day. A comminuted fracture of the right femur, with large sequestra present, was found upon examination. The leg was set in a Thomas splint that day. The patient made fair progress until Oct. 1, 1948, at which time swelling around the fracture area became marked. Fluoroscopic examination showed poor apposition and little healing. On Oct. 19, an intramedullary pin was inserted by way of the trochanteric fossa. An open reduction was necessitated to complete the pinning, at which time it was determined that the pin would not hold firmly due to a longitudinal crack in the bone shaft which permitted the shaft to expand when pressure was applied. The pin was therefore withdrawn, and the operative wounds closed. On the following day, that limb was amputated at the thigh, with the patient recovering in time for discharge on Nov. 2, 1948.

Case No. 2. A 1-year-old male part-Collie was admitted on Oct. 3, 1948, with a history of having had his right rear leg broken one week previously, at which time it had been set by the local veterinarian (1). Examination disclosed an infected compound, oblique comminuted fracture of the right tibia and fibula. On the following day, the tibia was realigned, and German silver wire passed through holes drilled in the bone to maintain the apposition. The limb was then splinted. Weeks passed, but no hard callus formed and apposition was eventually lost. On Oct. 27, the callus was broken down surgically and the wire removed. A shortened Stader pin was inserted in the proximal part of the tibia, then driven down into the medullary cavity of the distal part to bring the ends together and permanently implant the pin. The leg was then resplinted. On Nov. 26, the splint was permanently removed, and it was determined radiographically that repair was in progress. In succeeding days, gradual use of the limb was noted. The patient was discharged on Dec. 17, and made a complete recovery according to recent reports.
Case No. 3. A 4½-month-old male Pointer was admitted on Nov. 29, 1948, with a history of having had its right rear leg broken five days previously. Examination showed that the neck of the right femur was fractured. On Dec. 3, an intramedullary pin was inserted into the shaft of the femur by way of a hole drilled into the medullary cavity, and driven through the fractured region, through the head of the femur, and on into the acetabulum, using a closed reduction. On Dec. 11, the pin came out during the night. Fluoroscopic examination showed good apposition and healing, so no further treatment was given. The patient was discharged on Dec. 15, with subsequent progress uneventful.

Case No. 4. A 3-year-old male Toy Terrier was admitted on Nov. 30, 1948, with an involved history. He had been run over nine weeks previously, and his left front leg broken. The limb was splinted by the local veterinarian, kept splinted for two weeks, then kept unsplinted for a week so that an infection of the foot could be treated. The leg was again splinted and the dog sent home by the practitioner, with instruction to the owner to remove the splint in three weeks. This was done. The limb, after this time, was not healed, so the dog was kept at home in a box for three more weeks prior to being admitted to the clinic.

Radiographic examination revealed an unhealed fracture of the left radius and ulna, located mid-way on the shaft, with the formation of a false joint. On Dec. 1, 1948, the leg was opened over the fractured area, the callus curetted away, and the bone ends squared away. An intramedullary pin was permanently implanted in the radius and a splint applied to the limb. Subsequent healing was poor, with no use of the limb being obtained, nor any hard callus formation occurring. On Jan. 11, 1949, the limb was amputated after the owner’s permission was obtained. The stump healed slowly but satisfactorily, and the patient discharged on Feb. 10, 1949.

Case No. 5. An 8-months-old male Collie was admitted on Dec. 2, 1948, with a history of being hit by a car that day. Examination disclosed a simple transverse fracture of the left femur at the lower third of the shaft. On the following day, an intramedullary pin was inserted into the shaft by way of the trochanteric fossa, with apposition of the fractured bone obtained by an open reduction at the site of the break. The limb was splinted to immobilize it. Healing was uneventful and, on Dec. 30, the pin was removed. The patient was discharged on Jan. 3, 1949, and recovered complete use of the limb.

Case No. 6. A 6-year-old male Chow was admitted on Dec. 8, 1948, with a history of injury occurring one day previously (2). Examination showed a complete transverse fracture at the distal end of the left femur. On the following day, pinning was accomplished in a manner similiar to the preceding case. Healing was satisfactory, and the pin removed on Jan. 4, 1949. Gradually, use of the limb returned, and the patient was discharged on Jan. 22, 1949.

Case No. 7. A 6-months-old female Collie was admitted on Jan. 13, 1949, with an injury to the right rear limb of 10 days duration (3). Examination disclosed a compound transverse fracture of the tibia. On the day following, ½ in. of the exposed bone, necrotic in condition, was surgically removed. An intramedullary pin was inserted by way of a hole drilled into the proximal of the tibia, just below the femoro-tibial joint capsule, and driven down to unite the positioned ends of the fracture. The limb was then splinted. By Feb. 12, a good hard callus was palpable. The pin was removed three days later. The patient was discharged on Feb. 27, following marked return of the use of the limb. Since that time, repair has been complete, except for the possession of a slight limp caused by the shortening of the affected bone.

Case No. 8. A 2½-year-old female Pomeranian was admitted on March 26, 1949. Examination disclosed that the left
humerus was fractured \( \frac{1}{2} \) in. from the distal end. The next day the limb was splinted after traction brought the bone ends into apposition. Though the apposition remained good, healing was unsatisfactory and no hard callus formed. On May 2, Lugol's solution was injected into the callus in an attempt to stimulate ossification. This gave no results, and a false joint became noticeable gradually. On May 5, the callus was determined to be broken down, and apposition lost. On June 1, an intramedullary pin was inserted proximally in the humerus through a hole drilled into the shaft, and then driven down through the fractured region, the cubital joint, and on into the olecranon process. No union of the bone resulted by June 24, and the pin was removed. Euthanasia was performed, at the owner's request, on July 11, 1949.

Case No. 9. A 6-months-old male Collie was admitted on April 18, 1949, with a history of being hit by a car one day earlier. Examination showed an overlapping fracture of the left femur. On the following day, an intramedullary pin was inserted by way of the trochanteric fossa, after good apposition was obtained by means of a closed reduction. A Thomas splint was applied to maintain immobility of the limb. The splint was frequently removed by the dog, and as frequently replaced. Recovery was rapid and progressive, as shown by the gradual use of the limb. Radiographic examination on May 11 showed good apposition and healing. The pin was removed that day, and the patient discharged four days later. Recovery has since been complete and uneventful.

Case No. 10. A 16-months-old female Boston Terrier was admitted on April 28, 1949, with a history of having been hit by a car the night before. Examination showed a fracture of the left femur and of the pelvis. An intramedullary pin was inserted into the femur as in the preceding case, and no splint was applied. The fracture healed normally and the pin was removed on May 24. The patient was discharged on May 28, and used that limb in walking from the clinic.

Case No. 11. A 1-year-old male Boxer was admitted on June 25, 1949. Examination showed that the shaft of left femur was fractured. On the 27, pinning was accomplished in a manner similar to the preceding two cases. Healing progressed normally, and the pin was removed on July 18. Three days later, the patient was discharged. Recovery has since been complete and uneventful.

Case No. 12. A 3-year-old female Pointer was admitted on June 28, 1949. Examination disclosed a fracture of the left femur and ischium. On the following day, an intramedullary pin was inserted into the shaft of the femur by way of the trochanteric fossa, and driven down through the fractured region after apposition of the ends was obtained by an open reduction. Poor healing was evident as time passed, and no hard callus formed. On Aug. 5, the pin was removed. The owner requested euthanasia instead of amputation of the limb, and this was done on Aug. 11, 1949.

Case No. 13. A 4-year-old female Cocker Spaniel was admitted on July 2, 1949. Examination showed a fracture of the right humerus, with an accompanying separation of the lateral condyle. On July 4, by closed reduction, the lateral condyle was positioned and pinned into place by an intramedullary pin which was anchored in the medial condyle. The pin was removed on July 25, after quick healing had become pronounced. The patient was discharged on July 30, and recovery has been uneventful.

Case No. 14. A 6-year-old male Fox Terrier was admitted on July 10, 1949. Examination showed a fracture of the left tibia and fibula. On July 12, the fracture was reduced by traction and the limb immobilized with a plywood splint. On July 26, the splint was removed. No apposition of the fracture remained. A Thomas splint was applied, but failed to aid in recovery. On Aug. 12, an intramedullary pin was inserted into the tibia. Dicalcium phosphate was given daily. After a long, progressive healing period, the pin was pulled on Oct. 7, and the patient discharged one week later.
Case No. 15. A 6-months-old female Cocker Spaniel was admitted on July 12, 1949. Examination disclosed a simple fracture of the left femur. An intramedullary pin was inserted into the shaft of the femur by way of the trochanteric fossa and driven through the fractured region after apposition was obtained by a closed reduction. By Aug. 1, a pronounced hard callus was palpable and the apposition perfect. The pin was removed on Aug. 3, and the patient discharged six days later.

Case No. 16. A 2-year-old male hound was admitted on July 13, 1949. Examination showed a fracture of the left femur. This was pinned the following day in a manner similar to the preceding case. Healing was satisfactory and the pin was removed on Aug. 8. The patient was discharged on Aug. 15, and made an uneventful recovery.

Case No. 17. A 5-months-old Collie was admitted on Aug. 16, 1949, the same day on which he had been hit by a car. Examination disclosed a fracture of the right femur, at which site several large bone fragments rested. On the following day, an intramedullary pin was inserted into the shaft of the femur and driven through the fractured region after apposition of the bone ends was obtained by closed reduction. The dog seemed to improve steadily, but died without premonitory symptoms during the night of Sept. 6. The necropsy report stated that cause of death was a terminal metastatic pneumonia and septicemia originating from a peri-femoral abscess. A bone fragment distal to the fracture had rotated upward, causing loss of apposition of the proximal and distal ends of the femur.

Case No. 18. A 6-months-old female part-Collie was admitted on Aug. 29, 1949, after having been struck by a car that morning. Examination disclosed a transverse fracture of the right tibia. On the following day, an intramedullary pin was inserted into the tibial medullary cavity by way of a hole drilled in its proximal aspect. The fractured ends of the bone were positioned, and the pin driven through the fractured region to maintain the alignment. The patient recovered the use of the limb rapidly. Healing was marked, and the pin was removed on Sept. 20, 1949. The patient was discharged three days later, and has since made a complete recovery.

Case No. 19. A 1-year-old male Cocker Spaniel was admitted on Aug. 29, 1949, after having been struck by a car that morning. Examination disclosed a simple fracture of the right femur. On the following day, using an open reduction to obtain apposition of the bone ends, an intramedullary pin was inserted by way of the trochanteric fossa and driven through the fractured region. Healing progressed normally, and the pin was removed on Sept. 20. The patient was discharged three days later, and has since made an uneventful recovery.

Case No. 20. A 3-months-old male Boxer was admitted on Sept. 25, 1949, after being struck by a car. Examination disclosed an oblique fracture of the left femur. On the following day, pinning was accomplished in a manner similar to the preceding case. By Oct. 5, a large callus was palpable. The pin was removed on Oct. 8. On Oct. 11, the patient’s ears were trimmed, and he was discharged the same day. Recovery since that time has been complete.

Case No. 21. An 11-months-old Golden Labrador was admitted on Sept. 26, 1949, with a history of having been struck by a car 11 days previously. Examination showed a fracture of the distal fifth of the right femur, with some callus formation. That day, the old callus was broken down, the bone ends properly aligned, and an intramedullary pin inserted into the shaft by way of the trochanteric fossa. First use of the limb was noted on Oct. 8, and healing progressed satisfactorily. On Oct. 21, the pin was removed. The patient, alert and active, was discharged on Oct. 29, 1949.

Case No. 22. A 1½-year-old female German Shepherd was admitted on Oct. 11, 1949. Examination showed a fracture
of the right olecranon process. On the following day, the limb was extended and an intramedullary pin driven through the fractured olecranon process on into the medullary cavity of the ulna. By Oct. 24, healing and use of the limb were both good. The pin was pulled on Nov. 2, 1949, and the patient discharged three days later.

**Case No. 23.** A 4½-year-old male Cocker Spaniel was admitted on Oct. 17, 1949. Examination disclosed that the left humerus was fractured, with both distal condyles separated (4). The condyles were positioned by closed reduction, and three intramedullary pins were driven into the bones to maintain apposition. One pin joined the medial and lateral condyles. The others each positioned one condyle to the shaft of the humerus. There was a gradual recovery in the use of the limb. The pins were removed on Nov. 9, and the patient discharged the following day. Complete recovery has since been reported by the owner. (See Case Report in this issue.)

**Case No. 24.** A 6-months-old female part-Collie was admitted on Oct. 19, 1949. Examination disclosed a recent oblique fracture of the left femur, with part of the proximal part of the shaft split. Some sequestra were present. By means of an open reduction, the area around the fracture was cleansed of several bone fragments, and the broken ends positioned. An intramedullary pin was inserted into the shaft of the femur by way of the trochanteric fossa, and driven down through the shaft until the distal end of the fracture was firmly held in position. Recovery was uneventful. The pin was pulled five days prior to the patient’s discharge on Nov. 1, 1949.

**Case No. 25.** An 8-year-old male terrier was admitted on Nov. 12, 1949. Examination disclosed a simple fracture of the left humerus with a separation of the lateral condyle. On Nov. 14, an intramedullary pin was inserted through the lateral condyle and driven into the medial condyle, to position the separated condyle in place. A figure eight bandage was employed to obtain temporary immobility of the limb. By the end of the month, the patient was making some use of the limb, and healing was normal. The pin was pulled on Dec. 8, and the patient discharged on Dec. 15, 1949. At this time, he was making good use of the limb.

**Case No. 26.** A 4-year-old male Cocker Spaniel was admitted on Nov. 23, 1949, with a history of having been lame for two weeks. Examination disclosed a fracture of the right humerus, which had resulted in a separation of the lateral condyle. Partial organization had taken place in the area. The condyle was pinned in a manner similar to the preceding case. Recovery occurred rapidly. The pin was pulled three days prior to the patient’s discharge on Dec. 13, 1949.

**Case No. 27.** A 2-year-old male Cocker Spaniel was admitted on Nov. 25, 1949, after being hurt the day before. Examination showed the fracture to be the same type as the previous case, with the lateral condyle again separated from the humerus. On the following day, the lateral condyle was pinned to the medial condyle. The pin was removed on Dec. 20, 1949, and the patient discharged the following day. Recovery has since been uneventful.

**Summary and Conclusion**

This report covers 27 cases in which the technic of intramedullary pinning was employed. Complete fracture repair was obtained in 22 cases, or 81.4 percent of the total. Four cases, or 14.8 percent were non-successful, while 1 case, or 3.7 percent could not be definitely evaluated due to the early death of the animal.

The four cases in which success was unobtainable included one comminuted fracture with a longitudinal crack in the shaft of the bone distal to the site of the fracture. The resulting expansion of the bone upon the application of pressure would not permit proper holding by an inserted pin. Since this type fracture did not prove to be amendable to pinning, and since other methods of fixation had already been unsuccessfully attempted, amputation was necessary. The three other cases, though simple frac-
tures, were complicated by an inability of the body to institute normal repair processes. Other fixation methods had been unsuccessful in two of these cases prior to pinning. Amputation or euthanasia was performed, according to the owners' desires.

The majority of the cases in which intramedullary pinning proved successful, in this series of cases, were those 15 patients with simple or compound clean breaks of the shafts of the long bones. Many of these cases may have made good recoveries by other fixation methods, but it is felt that the intramedullary pin insured the maintenance of correct apposition of the fractured bones and most likely thereby hastened healing in some cases. In two of these cases, pinning was successfully used after the failure of other methods. Where the site of the fracture was at the neck of the bone, pinning was of definite value in immobilizing the whole bone against the tendency of the head of the bone to pull away from apposition with the shaft upon the slightest application of pressure to the joint of which it was a part.

Five cases are reported in which the condyles of the humerus were separated from the shaft of that bone. The use of the intramedullary pin to successfully maintain correct apposition during repair has been pronounced in these cases. It would be difficult to position and immobilize the separated condyles by other means.

There was but one case, successfully repaired with pinning, of a fracture of the olecranon process. This would also prove to be a difficult fracture to immobilize and repair properly by the use of other methods of fixation.

Many of the cases of compound comminuted fractures are usually accompanied by such severe tissue damage and loss of blood supply, that amputation of the limb is advisable. However, if the circulation to the part distal to the site of the fracture is not too greatly curtailed, pinning should prove of value in maintaining apposition and supporting the bone until the normal repair processes can assume these functions. The one case of this latter type reported in this series made a marked recovery after the permanent implantation of an intramedullary pin by way of an open reduction of the fracture.

In conclusion, it is interesting to note the rapidity of the healing of fractures in the young dogs reported on herein. For those dogs six months of age and younger, an average time of 23 days elapsed from the time of pinning until the date of discharge from the clinic, with the two youngest patients leaving the clinic in 12 and 16 days respectively.

References

1. Williams, R. C. Intramedullary pinning of the tibia in a dog. Veterinary Student 11:85-87 (No. 2) 1949.

Thirty rumenotomies for traumatic gastritis in dairy cows and 24 recoveries was the experience of Dr. Robert Nichols in 1948. Etiologically speaking nails and pieces of wire tied, scoring 15 cases each. *The Maine Veterinarian*.

There are about 900 artificial breeding association units in the United States, with approximately 1,800,000 cows enrolled in approximately 220,000 herds in these associations. Total costs average about $7.00 per cow.

Professionally, veterinarians function in four distinct, though overlapping, fields: (1) administering to sick and injured animals, (2) protecting the livestock industry against losses caused by diseases, (3) investigating problems of basic importance to the medical sciences and (4) protecting the public against diseases of animals that are communicable to man.