

Minimally Invasive Osteosynthesis Technique for Articular Fractures

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KEYWORDS

• Minimally invasive osteosynthesis • Articular • Fracture • Dog • Cat

KEY POINTS

- The repair of articular fractures requires anatomic reduction, rigid fixation, and early return to joint mobility.
- Minimally invasive approaches decrease morbidity and allow earlier return to function.
- Minimally invasive approaches include mini-arthrotomy and arthroscopic-assisted and percutaneous techniques.
- Minimally invasive osteosynthesis articular fracture repair is performed using implant systems and stabilization methods that are similar to those used in traditional open reduction and internal fixation.

INTRODUCTION

Articular fractures occur commonly in dogs and cats. Articular fractures can occur in any diarthrodial joint, but the most commonly affected joints are the elbow and hip. Repair of articular fractures requires anatomic reduction and rigid fixation to reduce the chance of osteoarthritis and joint dysfunction. Traditional arthrotomy can be used to accomplish these goals, but anatomic reduction can be difficult with certain fractures because of an inability to adequately view the joint surfaces. Minimally invasive osteosynthesis (MIO) using a minimally invasive or mini-arthrotomy approach, arthroscope-assisted approach, or percutaneous techniques have been used to treat articular fractures in humans and in dogs and cats.¹⁻¹¹ Arthroscope-assisted surgery has the advantages of superior visualization and less invasiveness, improved outcome, and accurate reduction, in addition to the diagnosis and repair of related injuries.^{1-3,10} Disadvantages of arthroscopic repair of articular fractures include a learning curve and initial expense of the needed equipment.

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GOALS OF REPAIR OF ARTICULAR FRACTURES

The goal of surgical repair of articular fractures is a return to pain-free motion and absence of osteoarthritis. The principles of articular fracture repair include:

1. Anatomic reduction of the articular surface
2. Rigid stabilization
3. Early surgical repair
4. Early mobilization of the joint

Adherence to these important principles is critical to giving the patient the greatest opportunity of maintaining a healthy articular surface, viable hyaline cartilage, normal periarticular supporting connective tissues, and less muscle atrophy and fibrosis. Deviation from the principles will likely lead to poor outcome characterized by osteoarthritis, joint fibrosis, muscle atrophy, and chronic pain.

FRACTURE ASSESSMENT

Articular fractures involve disruption of the articular surface of the joint within the synovial cavity. Articular fractures are most common in the elbow and hip, but they can also occur in the shoulder, carpus, stifle, and tarsus. Fractures of the joint surface have a greater likelihood of the development of osteoarthritis. Many of these fractures also occur in growing dogs and cats. The physis is a common site for fracture because of the relatively weak zone of hypertrophied chondrocytes. Fractures through the physis have been classified by Salter and Harris into 6 types.¹² The severity of physeal fractures increases with the increasing numerical type of Salter-Harris fracture. Some Salter-Harris fractures occur within the joint but do not involve the articular surface. Salter III and IV fractures invade the joint surface and result in an articular fracture. Increased severity of physeal fracture is associated with increased chance of growth disturbance of the physis, potentially leading to limb shortening or angular limb deformity. Identification of an articular component, presence of preexisting orthopedic conditions, presence of physeal involvement, fracture classification, duration of injury, and expected patient and owner compliance are important to consider in the decision-making process for the treatment plan for articular fractures.

INDICATIONS FOR MIO

The type of surgical approach for articular fractures should be considered carefully before the start of surgery. Traditional surgical approaches to the joints of the dog and cat have been previously reported and can be used to treat all articular fractures.¹³ A minimally invasive surgical approach using an MIO technique is optimal for repair of certain articular fractures, particularly fractures that are minimally displaced, simple (2 pieces), and acute. This may be accomplished using arthroscopy and percutaneous placement of implants or using an arthroscope through a miniarthrotomy to better view the articular fracture.^{1-3,10} The use of an arthroscope within an arthrotomy incision is known as arthroscopic-assisted arthrotomy.¹⁴ The miniarthrotomy incision is much shorter than the arthrotomy incision used to treat articular fractures using traditional open reduction and stabilization techniques. The miniarthrotomy incision can be extended as needed to apply implants to stabilize the fracture. A MIO technique can be used for articular fractures of the glenoid, humeral head, humeral condyle, anconeal process, carpus, acetabulum, femoral head, femoral condyle, and tarsus. A MIO technique improves the surgeon's view of the articular surface and results in a more precise repair as a result of the magnification provided

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