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EXTRA-ARTICULAR EXTERNAL FIXATION, A STRATEGIC TOOL IN TEMPORARY STABILISATION

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INTRODUCTION

Extra-articular external fixation is a fundamental pillar of veterinary orthopaedic traumatology, especially in the management of complex fractures, open fractures and multiple traumas. This technique allows bone injuries to be temporarily stabilised using a minimally invasive approach, preserving soft tissues and facilitating the control of wounds and local inflammation.

Its importance lies in its versatility in adapting to different clinical situations and its ability to provide effective stabilisation, which can be definitive or serve as a bridge to more complex or definitive surgery.

This lecture explores the fundamentals, indications, techniques, postoperative management, and possible complications of extra-articular external fixation, highlighting its strategic role in current surgical management. In addition, relevant clinical cases will be presented, such as complex elbow fractures and patellar tendon ruptures in the knee, where extra-articular external fixation has shown promising results.

Extra-articular external fixation has established itself as a fundamental technique in veterinary orthopaedic traumatology, particularly in the management of complex, open fractures and in polytrauma patients. Its great advantage lies in offering effective bone stabilisation through an external system that minimises surgical invasion and preserves the integrity of soft tissues and joints, a crucial aspect in species such as cats, where delicate anatomy and limited bone mass make conventional approaches difficult. Recent studies, such as that by Prackova et al. (2022), have emphasised the importance of accurately knowing the "safe corridors" for placing pins in long feline bones, as the anatomy of these limbs differs considerably from that of dogs, and the lack of this information can increase the risk of neurovascular or muscle damage during external fixation. This specific anatomical knowledge allows for more precise and secure insertion, optimising the stability of the fixator and reducing associated complications.

BASICS AND SPECIAL FEATURES OF EXTRA-ARTICULAR EXTERNAL FIXATION



Extra-articular external fixation is based on stabilising the fractured bone using external elements that are anchored to the bone through pins or screws, avoiding penetration or interference with neighbouring joints. This is especially important for preserving joint mobility and preventing stiffness and long-term complications.

In terms of clinical application, extra-articular external fixation not only stabilises fractures, but is also strategic in the temporary stabilisation of joint injuries, such as subluxations or dislocations, especially in complex joints such as the feline tarsus. The experience reported by Kulendra et al. (2011) highlights that the configuration of the fixator, particularly the number of pins proximal and distal to the joint, influences stability and complication rates, suggesting that a greater number of anchor points may reduce mechanical failures. Furthermore, although the presence of wounds and compromised soft tissues prolongs hospitalisation and increases costs, external fixation allows effective access and treatment of these injuries without compromising bone stability.

The system consists of transosseous needles, external rods or tubes, and connectors or ball joints that allow the bone position to be adjusted and maintained. The system can be modulated according to stability requirements and the location of the fracture.

This type of fixation is particularly beneficial in bones with low bone mass or in fractures that require staged management. The technique also allows for easier management of affected soft tissues, as it does not require large incisions for placement, and offers the possibility of modifying the configuration in case of failure or clinical evolution.

MAIN INDICATIONS

Open joint fractures or fractures involving soft tissue

Open joint fractures (e.g., tarsal fracture due to a traffic accident with tissue abrasion) are one of the greatest challenges in orthopaedic traumatology due to the high probability of bacterial contamination and damage to surrounding soft tissues, including skin, muscles, tendons, and blood vessels.

In these cases, traditional internal fixation, such as the placement of plates or screws, is usually contraindicated in the initial phase, since the introduction of implants into a contaminated wound can facilitate deep infections that compromise bone viability and the patient's overall recovery.

Extra-articular external fixation is a fundamental alternative because it stabilises the bone without the need for major approaches or implanting material within the compromised site. This method allows direct access to the wound for repeated debridement, drainage and frequent dressing changes, promoting an optimal environment for soft tissue healing. Furthermore, by maintaining bone stability, movements that could aggravate the injury or delay consolidation are minimised, without interfering with local wound treatment.

Once the soft tissues and skin have recovered, definitive rescue surgery such as pantarian arthrodesis may be considered.



Multiple trauma and unstable patients

Patients with multiple injuries, whether from accidents, falls or high-energy trauma, often present with a complex clinical picture involving haemodynamic instability and compromise of vital organs. In these situations, extra-articular external fixation is a crucial tool for the rapid and safe stabilisation of fractures without subjecting the patient to extensive surgery that increases physiological stress. Its minimally invasive nature allows for temporary stabilisation of the bone, facilitating the simultaneous management of other injuries and improving the patient's tolerance to subsequent surgical procedures. By reducing surgical time and tissue manipulation, systemic inflammatory responses are also minimised, promoting faster recovery. Therefore, this technique is ideal for initial management in critically ill patients, also allowing for progressive adjustments as the patient's general condition improves.

Comminuted or unstable fractures

Comminuted fractures, characterised by the presence of multiple bone fragments, represent a technical challenge for stabilisation. Perfect anatomical reconstruction can be difficult or even impossible in some cases, especially in joint areas where congruency is essential for function. Extra-articular external fixation, used as an adjunct or temporary technique, offers adequate stability that allows immobilisation of the fragments while maintaining some flexibility for progressive bone healing. This controlled flexibility can stimulate the biological repair process, avoiding the absolute rigidity that sometimes limits bone healing. Furthermore, as it is a modular system, subsequent adjustments can be made to improve alignment or change the configuration according to clinical progress.

Severe oedema or inflammation

Severe inflammation and oedema at the fracture site or associated injuries can complicate the surgical approach, increasing the risk of necrosis and postoperative complications. In these cases, extra-articular external fixation allows the bone to be stabilised without increasing tissue aggression, which is especially valuable when there is active infection or inflammation. This technique makes it possible to postpone definitive internal surgery until local conditions improve, while maintaining sufficient stability to prevent displacement and pain. In addition, it facilitates clinical monitoring and conservative treatment of oedema and infection, as it does not interfere with access to and care of the affected area.

Joint stabilisation after tendon surgery

In these cases, extra-articular external fixation is particularly valuable. For example, after repair of the calcaneal tendon, patellar tendon or triceps brachii tendon, where the force and load borne by these structures are very high during locomotion, temporary joint stabilisation by external fixation



helps to protect the suture by preventing the joint from flexing prematurely or undergoing excessive stress.

This is crucial because these tendons transmit considerable forces when moving the tarsal joint (in the case of the Achilles tendon) or the elbow joint (in the case of the triceps tendon). Extra-articular external fixation maintains the joint in a functional position, usually extended, limiting the range of motion that could damage the repair, while allowing safer patient management during the initial healing phase. Furthermore, as it is a less invasive and adjustable method, it facilitates postoperative control and minimises complications such as joint stiffness or muscle weakness.

TECHNIQUES AND TYPES OF EXTRA-ARTICULAR EXTERNAL FIXATION

Extra-articular external fixation systems

These are mainly classified into three types:

- Uniplanar fixation, with needles inserted in one plane and connected by external bars. This is the simplest form and is very useful in extra-articular fixation.
- Biplanar or orthogonal fixation, with pins in perpendicular planes connected by rods, providing greater rigidity. It is used when greater structural compromise is needed.
- **Hybrid systems:** These combine different configurations and types of fixation to adapt to complex situations or special locations.

Needle placement

Transosseous needles are placed under general anaesthesia, with pre-drilling and care taken not to damage neurovascular structures. Their positioning is critical to avoid mobility and loosening. They should preferably be inserted into thick cortices at an angle that provides maximum resistance.

Application techniques

- Percutaneous insertion, minimising soft tissue damage.
- Intraoperative radiological control (fluoroscopy) to verify reduction and position.
- Progressive dynamic adjustments to optimise the process.

ADVANTAGES OF EXTRA-ARTICULAR EXTERNAL FIXATION

- Less invasive surgery, with reduced iatrogenic damage.
- Preservation of soft tissues and joints, allowing for better mobility.



- Accessibility for wound management, facilitating the treatment of open or infected fractures.
- Possibility of adjustments without extensive surgery, allowing for postoperative modifications and corrections.
- Rapid stabilisation in critical patients, ideal in multiple trauma and emergency situations.
- Facilitates early physiotherapy, as the external structure allows for controlled mobilisation.

PRESENTATION OF CLINICAL CASES

Selected clinical cases will be presented that illustrate the effective application of extra-articular external fixation in complex situations:

- Complex fractures with joint involvement, where external fixation allowed stabilisation and functional preservation.
- Tendon ruptures, a challenging injury that, combined with external fixation, facilitates segment stabilisation and functional recovery.

These cases will show the planning, surgical technique, evolution and clinical results, demonstrating the usefulness and versatility of extra-articular external fixation.

MANAGEMENT OF COMPLICATIONS

Frequent complications

- Infection at insertion points, the most common complication, preventable with asepsis and care.
- Loosening or fracture of pins, requiring evaluation and possible replacement or adjustment.
- Bone misalignment, which can be corrected by adjusting the external system.
- Neurovascular injuries, which can be prevented through careful technique.

Management

Early detection and treatment of infections or mechanical problems is essential for success. Collaboration with physiotherapy aids functional recovery.



CONCLUSIONS

Extra-articular external fixation is an indispensable strategic tool in veterinary traumatology. Its versatility in stabilising complex or open fractures, together with its low impact on soft tissues and joints, makes it an essential technique for both temporary stabilisation and definitive cases when internal fixation is not feasible.

Careful management, close monitoring, and appropriate selection of the system maximise its benefits, achieving optimal results in the patient's functional recovery.

BIBLIOGRAPHICAL REFERENCES

1. Piermattei DL, Flo GL, DeCamp CE. *Handbook of Small Animal Orthopaedics and Fracture Repair*. 5th edition. Elsevier; 2016.
2. Fossum TW. *Small Animal Surgery*. 5th edition. Elsevier; 2019.
3. Tobias KM, Johnston SA. *Veterinary Surgery: Small Animal Expert Consult*. 2nd edition. Elsevier; 2017.
4. Prackova I, Paral V, Kyllar M. Safe corridors for external skeletal fixator pin placement in feline long bones. *J Feline Med Surg*. 2022 Oct;24(10):1008-1016. doi: 10.1177/1098612X211057329. Epub 2021 Dec 6. PMID: 34870491; PMCID:
5. Jaeger GH, Wosar MA, Marcellin-Little DJ, et al.. Use of hinged transarticular external fixation for adjunctive joint stabilisation in dogs and cats: 14 cases (1999–2003). *J Am Vet Med Assoc* 2005; 227: 586–591. -
6. Kulendra E, Grierson J, Okushima S, et al.. Evaluation of the transarticular external skeletal fixator for the treatment of tarsocrural instability in 32 cats. *Vet Comp Orthop Traumatol* 2011; 24: 320–325. PMCID:10812313.
7. Gadallah S, El-Sunsafty M, Sharshar A, Misk T, Fischer C, Jaehrig R, Feichtenschlager C, Kramer M, Hammad A. Short-term outcome after treatment of talocrural instability in cats using modified type II transarticular external skeletal fixation. *Sci Rep*. 2024 Apr 2;14(1):7724. doi: 10.1038/s41598-024-57781-w. PMID: 38565922; PMCID: PMC10987580.