How to Choose a Fracture Repair Method Liz LaFond, DVM, DACVS, CCRP

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This session will focus on the decision-making process for fracture repair. While systemic assessment of a fracture patient is clearly important, it will not be the focus of this session - an assumption will be made that pre-surgical stabilization and management has been successful. Examples of simple fractures will be presented. It is assumed that attendees have an interest in orthopedics and an understanding of basic techniques.

The challenge with fracture management usually does not lie in identifying that a fracture is present, but rather in deciding which repair methods might be appropriate and recognizing which repair techniques may be contraindicated. For all cases, an accurate and complete history, thorough physical exam, and diagnostic imaging are paramount in guiding the surgeon toward the most effective fracture management. With those tools in hand, and with the application of solid logic, the mystery can be taken out of fracture management decision making.

Options for fracture repair

Fracture repair methods can vary from markedly invasive to minimally- or non- invasive and from highly mechanically stable to rather tenuous mechanically. Each method has its advantages and disadvantages for a given fracture and these must be considered and weighed when selecting an appropriate repair method or recognizing contraindicated repair methods. When deciding upon a fracture management method, the surgeon is encouraged to review a checklist of all fracture management methods, even when the "correct" repair method seems "obvious". In particular, one should refrain from trying to figure out THE correct method. Rather, consider all options and review advantages and disadvantages of each. Disadvantages of some methods may be overcome by combining with other methods. When the optimal method lands outside the comfort zone of the surgeon, the case should be referred. Following is a list of repair categories and what to consider:

Method	Specialized resources or training required	Advantages	Disadvantages
Cage rest	Minimal, requires "sensible" patient and compliant client	Non-invasive, inexpensive	Cannot influence degree of anatomical reduction, little control over movement
External Coaptation	Minimal	Less invasive, may be less expensive (bandage changes and management of splint disease may change that).	Relatively little influence on degree of anatomic reduction Confined to use on distal limbs
Linear External Fixation	Readily available in most clinics	Can be applied with minimal disruption of fracture site Apposition of fracture fragments possible Can provide access to open wounds Neutralizes all fracture forces	May require multiple rechecks May be challenging to apply for some fracture configurations
Hybrid or Circular External Fixation	Specialized equipment and training required	As for external fixation May be applicable for wider variety of fracture configurations Can neutralize all fracture forces well.	As for linear external fixation

Interlocking Nail	Specific nailing equipment required	Neutralizes all fracture forces well	Not appropriate for use with very distal fractures or in presence of some fissures
Bone plate DCP or LC-DCP	Available in many clinics	Strong when well applied, easy for most simple fractures. Neutralizes all forces well.	Highly invasive, disrupts tissues, expensive implants
Internal fixation, specialized implants (BOP, locking plate, reconstruction plates, etc)	May require specialized equipment and implants	Implants can be tailored to very unusual and complex fracture configurations Allows good visualization of fracture	Requires specialized training and equipment in many cases. May be expensive
Intermedullary Pin	Readily available	Inexpensive, simple to apply, minimally invasive Neutralizes bending forces well	Does not neutralize rotational, shear, or distraction forces Supplementary fixation necessary
Interfragmentary wire	Readily available	Inexpensive, simple to apply Useful as supplement to other fixation methods	May be difficult to apply WELL Limited neutralization of bending and distraction forces
Interfragmentary screws	Available in most practices	Useful as supplement to other fixation methods	Limited neutralization of bending forces Must be used with other methods of fixation

Fracture patient assessment - "Resist the cookbook"

Fracture Patient Assessment refers to using algorithms to help ensure that the surgeon considers all the potential factors that may affect successful fracture healing. Utilizing such algorithms can aid the surgeon in sorting out how to weigh various fracture repair methods available. The process involves considering mechanical, biological, and clinical factors that are important in successful healing. Various scoring methods have been developed (Fracture Assessment Scores) to quantify results of the assessment. Whether assigned a numerical score or not, using the Fracture Patient Assessment checklist pre-operatively can ensure important factors are not missed.

Mechanical factors

Evaluate such things as how well the bone can be rebuilt and whether there are multiple limbs involved. Accurate reconstruction of the bone can provide the mechanical advantage of load sharing so that less dependence on the strength of the implants is necessary. Patients with multiple limbs injured may be less able to avoid use of repaired leg(s), necessitating more aggressive repair methods.

Biological factors

Include local and systemic considerations. Damage to local tissues - whether soft tissue wounds associated with a high-energy fracture or other host or environmental factors affecting tissue integrity - affect the healing capacity of the bone-tissue construct. Systemic biological factors include age and co-morbidities that may affect the body's ability the recruit tissue healing components.

Clinical factors

Include expected patient or client compliance and all too often financial considerations of the client.

Armed with a well-considered Fracture Patient Assessment and an understanding of the advantages and shortcomings of each repair method, the surgeon is able to provide the optimal management for the situation and to anticipate and avoid complications.