

ARTHRODESIS DISTAL LIMB VARIETY PACK:**Pancarpal, carpoMC, pantarsal, tarsoMT****Synopsis-- Anatomy and the Disease**

Joint instability may develop in any of the four planes around the joint, or most commonly, multiple planes-- medial, lateral, cranial (dorsal), caudal (palmar/plantar). Finding out which of these has lost its ligaments is achieved remarkably well with stressed radiographic views. (I'll reference my 2018 Blog on Stressed View radiographs for more depth to this discussion <https://directvetsurg.com/vet-blog/>). Any "soft tissue" ruleout listed after taking radiographs of the carpus or tarsus can be fine-tuned with stressed views! Knowing which areas have been injured and to what extent is essential for treatment planning.

The distal antebrachial and crural joints that are often sprained catastrophically, and they are also the most accepting of a fusion to achieve good function. A grade 3 sprain involves loss of sufficient ligament(s) integrity to make the joint grossly unstable and in need of assistance for return to good function. Select injuries can be primarily repaired and then externally supported. Some patients can be managed with careful use of professional orthotics alone. Surgical history and experience (human and veterinary) have shown that we are not good at replicating/reinforcing ligamentous integrity when too much or too many is lost. The solution then turns to arthrodesis, the "fusing" of the bone(s) above and below the luxated joint. We can do this fusing surgically or "conservatively" with long-term/life-long rigid orthotics.

As a general statement, pancarpal/pan tarsal are bigger deals than carpoMC/tarsoMT arthrodesis. "Pan-" indicates the entire joint unit (all components from antebrachium/crus to foot) is fused. The loss of ROM and thus the remarkable stress placed on the fusion (i.e. it WANTS to bend post treatment) creates a remarkable immobilization challenge and the associated morbidity. The smaller fusions of the minor carpal/tarsal joints and on into the MC/MT are less fraught because they move through a much more limited ROM and less implant stress. Additionally, the insult to ambulation is much more significant from the pancarpal/pantarsal fusion than from the smaller, inherently less mobile joints.

Activity expectations, body size, body weight relative to size, age, underlying joint pathology (immune-mediated, open/contaminated) all play a role in the decision-making and outcome of arthrodesis procedures. Careful case selection and thorough owner education is needed for setting and meeting expectations.

The other/larger joints what have arthrodesis techniques described are the stifle, elbow and shoulder. None of these are highly successful, and careful patient selection and client preparation are essential for these rare cases.

Surgical Overview:

The offending joint must be well characterized with radiographic "stressed views" in all four planes (lateral/medial/cranial/caudal stress) to plan a surgical arthrodesis. With that information and signalment, a surgical plan can be well tailored. See <https://directvetsurg.com/stressed-views-may-2018/>

The cartilage surfaces inside each offending joint are denuded of their cartilage and cancellous bone graft packed in the space(s) created. Surgical stability is afforded with pin, plate/screw, or wire/screw implants bridging the offending joint(s). After closure, the joint is supported short-term with a heavily padded splint and thereafter for 6-12wks with a well fitted splint changed weekly. Often, later in the healing phase, a custom

orthotic can be used to make the “bandage process” less onerous for staff, owner and pet alike (fitting this can happen after the surgical swelling has resolved.)

The **indications & rationale** for surgical treatment are:

- A distal antebrachial and crural joint that has a grade 3 sprain with a grave prognosis for return of inherent stability using coaptation alone.
- Medium-giant breeds
- Large body weight relative to skeletal size
- Complex intraarticular fractures
- Intractable degenerative joint disease/osteoarthritis
- Immune mediate destruction of joint(s)

Other options for treatment (besides surgery) are:

- Coaptation for 6-12wks followed by life-time use of orthotic if stability/comfort not achieved conservatively
- Permanent use of well-tolerated custom orthotics can be a successful option

Supportive/ancillary options with surgical treatment are:

- Custom orthotics will reduce the duration of medical coaptation and make the gradual reduction in external support easier to manage (i.e wear 24/7 then wear daytime only then wear activity only, etc.)
- Lifestyle modifications to accommodate a reduced stress load on front limb (primarily)

The **perioperative experience** for pet and owner includes:

- Before surgery planning, good diagnostic radiographs (often including stress films) will be needed, achieved with adequate sedation/anesthesia.
- For the first week or so after surgery, bandage changes every day/few days will be needed, with light/oral sedation.
- For the remaining 1-2mo, weekly bandage changes will be needed, with sedation as needed based on personality.
- Strict activity restriction (10-16wks)
- A custom orthotic can be measured/prepared after postop swelling is reduced. Twin Cities Animal Rehab is a good local resource. Web-based orthotic resources will require informed DVM participation in the molding/casting/fitting process.
- Careful home management (activity restrictions and bandage supervision) will be a daily task, and close communication must be maintained with attending veterinary staff.

Expectations for outcome are:

- When arthrodesis is chosen, the client expectations need to be clear. An arthrodesis needs external support (either medical splints or custom orthotics), and “bandage management and compliance” is a lot of work! Three to four months of daily attention and weekly veterinary visits is the norm. Implant removal is a common necessity after full healing. Normal leg function is rarely an outcome; comfortable leg function with functional lameness IS a realistic outcome.
- When an arthrodesis is successful, return to “normal” leg use and gait depends on which joint was fused. The joints with marked range of motion (radiocarpal and tibiotarsal joints) are needed to walk/move “typically”; losing the ROM in these major joints changes the gait significantly. A healthy arthrodesis will not be painful, but circumduction/swinging out of the limb is the most common gait alteration.
- If an arthrodesis is not immediately successful, longer duration of splinting will be necessary. Radiographs and examination help guide decision making about splint duration.
- When an arthrodesis becomes infected, longer-term planning for implant removal and orthotic wear will be necessary. An infected arthrodesis is a big deal, very frustrating for all involved, and will require abundant communication to both prevent and manage.

Complications that may arise with this procedure are:

- Bandage-related skin complications are common given the duration of bandage/splint wear. Strict bandage compliance is necessary to minimize these but will not eliminate this concern.
- Implant related infections are reasonably common; if they occur, most/all implants must be removed following appropriate healing. In some severe infection circumstances, implants must be removed prior to appropriate healing and longer term coaptation will be needed (custom orthotic recommended).
- Implant migration (pins and screws) is reasonably common; if they occur, specific removal as indicated may be necessary. Additional support may be necessary depending on remaining implant strength.

Postoperative **outcomes may be poor** due to the above complications, and/or:

- Bandage non-compliance with associated complications.
- Other, unrelated arthropathies or disabilities
- Progressive breakdown/instability of adjacent (intercarpal/tarsal) joints
- An unsuccessful arthrodesis that remains painful and poorly managed may result in a recommendation for amputation.

What a surgeon needs prior to surgery:

- Affected leg/body part “marked” by owner for confirmation (wax “costume makeup” works well)
- Skin near the surgery site CLEAR of infection (papules, pustules, crusts, collarettes, etc.) If urgent surgery, owner must be alerted to *increased risk* of incisional, deep and/or implant infections.
- An informed and committed owner.
- Quality radiographs demonstrating location of instability.
- Plan for external coaptation (if custom orthotics, relationship/communications established with orthotist and plan in place.)

General considerations and complications for all surgery/anesthesia procedures are:

- *Difficult and/or painful anesthetic recovery (variable; may require additional medications or re-hospitalization)*

- *Incisional infections (rare, minor; usually require oral antibiotics)*
- *Incisional dehiscence (rare, minor or major; may require surgical revision)*
- *Adverse anesthetic event (rare, major; may result in serious impairment or death)*

Proper owner expectations are important to a successful experience and patient outcomes. Please discuss this information with your clients while assisting them with decision-making for **arthrodesis of distal limb joints**.

Lara Rasmussen, DVM, MS

Diplomate, American College of Veterinary Surgery

DIRECT VETERINARY SURGERY, LLC