FRACTURES in the FRENCH BULLDOG

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INTRODUCTION:

This talk looks at two common fracture types we see in brachycephalic patients. The first (that most time will be spent on) are humeral condylar fractures. The second are proximal tibial metaphyseal fractures. This talk is a review of the recent literature, especially as it pertains to the French Bulldog.

BODY OF TALK:

Humeral condylar fractures (HCF) are reported to account for approximately 40% of humeral fractures in dogs They can be characterized as lateral, medial, or bicondylar Y/T fractures and they are articular fractures, usually in younger dogs but not always. Around 2/3rds of condylar fractures are reported to be lateral. The thought is that lateral condylar fractures are more common due to the eccentric loading via the radius through the lateral condyle i.e it predominantly loads through the lateral condyle. Also the lateral epicondylar ridge is thinner.

Then the other approx. 1/3rd are either Y orT fractures or medial condylar fractures. Medial condylar fractures are the least common of all, but in some papers there is an indication that Frenchies may be more prone to medial condylar fractures.

One of the factors that is being researched about these fractures, is whether there is an underlying problem or condylar pathology that predisposes these breeds.

There are two principal theories as to why dogs form humeral fissures.

1 - A fissure may represent a failure of the medial and lateral secondary centres of ossification of the humeral condyle to fuse during skeletal development – so the growth plate fails to close. This is why fissures in this region used to always be known as 'incomplete ossification of the humeral condyle or IOHC). However, this theory only stands if you can prove that the growth plate never fuses and wasn't fused at the time of fracture. But in spaniel breeds, there has been documented evidence of condyle fusion, but then subsequent progression of fissures over time. So this is where there is a dog that has a fracture, but for some reason it has had a CT in the past, and it was normal.
Therefore a second theory emerged
2 – Fissure from stress fracturing over time. Additional support for this is that they often present as adults versus immature dogs, which you may expect if it was a delayed ossification.

Given that there was predisposition in these breeds, what surgeons started to do, is to CT the other limb and look for a fissure. And when these fissures were found in the other leg, sometimes the dog has lameness even when there is no fracture, and then in the realms of around 15-20% will go on to fracture. Therefore prophylactic screws were placed in some of these. The problem with these is they had a high rate of complications.

The Frenchie is also a front runner for this fracture configuration, but there were a few differences that made us wonder, are Frenchies the same? Do they also have fissues that potentially develop over time from stress fracturing, or is it a different pathophysiology? And most importantly, should we be placing prophylactic screws or cutting the proximal ulnar if we see a fissure in the other side?

Firstly, a few facts about condylar fractures in Frenchies
They are 49x more likely to develop a humeral condylar fx versus other breeds.
Lateral condylar fractures are even more common than they are in spaniels. Around 70%
over 90% of Frenchies with these fractures are immature – this is potentially important as often they are seen in adult spaniels.

Frenchies also have fissures in the contralateral limb (around half) at the time of fracture.

But importantly, these fissures are generally seen in young dogs, and there is evidence of these healing. Therefore, this could be evidence of a true incomplete or delayed ossification type pathology.
Then this was looked at further in Frenchies with a CT study. They confirmed that actually almost all of these fissures in the contralateral limb, heal on their own.

Why is this important? It is important because basically it looks like we don't need to place screws in the contralateral limb of these Frenchies.

Treatment:
These fractures are articular and therefore require anatomic reduction with rigid fixation. We need direct bone healing with no callus. For these same reasons, we want to repair these fractures as soon as possible.

These fractures are repaired with a bone screw in the very centre of the condyle with a central fill of around 40-50%. Typically the epicondylar component can be repaired either with a bone plate, screws or K-wires placed from distal to proximal. If using bone plates, there are advantages to locking plates here as they do not need to be perfectly contoured, you can use monocortical screws to avoid the supracondylar foramen and there is less risk of loss of reduction by pulling the bone to the plate with screws (as with a DCP).

In terms of K-wires, multiple studies have shown an increased risk of complications with k-wires compared to plates. Complications seen with these fractures include persistent lameness, reduced range of motion, elbow arthrosis, nonunion, fixation failure, seroma formation and infection. However a recent publication looking at a large cohort of French bulldogs (136), found that there was no difference in outcome between fixation methods.

Proximal metaphyseal fractures are also seen commonly in the French Bulldog. They tend to occur at the transition from diaphyseal to metaphyseal bone and have a characteristic curvilinear configuration. One possible explanation is that this is the shape of the transition from diaphysis to metaphysis may be curvilinear. Other possibilities include differing rates of endochondral ossification within the metaphysis, or the attachments of the ligamentous (collateral ligaments) and soft tissue structures (joint capsule) to the proximal tibia may provide protection to the physis and may contribute to the formation of a curvilinear fracture configuration at this age.

They typically occur when the dog lands with an extended limb and the metaphyseal bone is potentially softer than the physis as it is in children. The problem with them is that they often result in a craniomedial displacement of the distal tibial fragment relative to the proximal fragment and this results in angulation of the distal limb and the caudal tipping of the proximal tibia, and increases the risk for development of a steep tibial plateau angle and therefore increased strain on the cranial cruciate ligament. The other concern is valgus angulation in the distal fragment.

Mean age at the time of the injury is around 18.5 weeks. Proximal tibia fractures are around 7% of tibial fractures. There is some similarity to humans in that they tend to occur in immature dogs and in children they are called cozen's fractures and occur in children around 3-6 years.

They can be stabilised either with pins, external coaptation, or plates. A variety of plates have been reported – T plates, L plates, TPLO plates, Dynamic compression plates.

Cases stabilised with cast/splints have a high rate of complications and is not my recommended treatment option. When repairing with plates, you need to be careful to avoid the proximal physis or you can get ALD deformity resulting. Fluoroscopy is very helpful.

CONCLUSION

In conclusion, for immature French bulldogs with a HIF diagnosed in the contralateral limb at humeral condylar fracture repair, I do not place a prophylactic screw. I repair these fractures for the most part with a large transcondylar screw and epicondylar plate fixation with locking plates. Fluoroscopy is utilised.

Proximal metaphyseal tibial fractures require great care not to penetrate the proximal tibial physis and complication rate for these fractures is also fairly high.

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