TOTAL KNEE REPLACEMENT – THE AUSSIE EXPERIENCE
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Knee replacement in dogs has been available for approx. five years but has been performed by only a handful of centers around the world. In contrast this procedure is commonplace in human orthopedics. The clinical success rates and durability of the implants are high and surgeons can be confident in quality outcomes. Unfortunately we really have a paucity of data pertaining to canine TKR, mostly research using normal dogs experimenting with different designs. I have personally been involved with about 40 cases and have experienced a steep learning curve. We have managed a range of complications but equally have seen many dogs do very well clinically. I still offer the surgery for suitable cases and feel that surgical technique is a major player in short-term outcome.

Relevance:
Hip replacement has been accepted by the veterinary orthopedic community as a reliable and durable treatment option for moderate to severe hip osteoarthritis. Most specialists have chosen to invest their time and funds in advanced surgical training and in purchasing both the instrumentation and inventory to offer this procedure. Gearing up for THRs would be considered a sound financial investment in terms of paying for your time and expenses. Dogs seem to do very well immediately after surgery and the requirement for physical therapy is questionable in achieving a favorable outcome. Some clients will return for a second contralateral operation if the index procedure is perceived to be successful. In my hands, TPO has become a less common surgery in the borderline juvenile dysplastic patient as the success rate with a cementless hip replacement is high.

Knee replacement has not yet been accepted in the veterinary orthopedic community. Most specialists question the indications and verbalise that they do not see many cases where they would consider this procedure. There is concern over the unknown and there are few reports of this procedure in the veterinary literature to date. Mostly, people worry about what happens if the surgery fails (collateral rupture, luxation, infection). There is no easy solution to a major complication like this. In contrast, hip endoprostheses can be explanted and a salvage procedure performed with clinically acceptable results. Revision knee replacement surgery has not been reported in the canine veterinary literature.

Training:
BioMedtrix offers a short course comprised of instructional lectures, an explanation of the implant design features, an overview of the instrumentation and a cadaver laboratory on normal stifles showing the basic technique. This introductory course allows participants to experience the system and decide if they would like to go further. The next step would be to loan a kit and implant some trial prostheses into cadavers in their own hospital. Radiographs from a minimum of three cases are submitted to BioMedtrix for scoring. The company will authorize that surgeon as a user and be willing to sell them implants. BioMedtrix does actively encourage ‘trainee’ surgeons to
travel to another surgeon and participate in a clinical procedure to gain experience before attempting their first clinical case.

In Australia, two specialists (Preston, Lidbetter) decided to learn the procedure together and operate an initial series of cases with a human orthopedist with advanced training in arthroplasty. The first step was to observe TKR at human hospitals. Both surgeons then undertook the BioMedrix course. Upon return to Australia, two cadaver stifles were implanted immediately prior to a clinical series of five cases. Following this the surgeons would travel interstate for each subsequent case at the others practice (Melbourne, Sydney) until both surgeons were confident that they could perform the procedure ‘solo’.

I believe that the one day course format is insufficient training to enable an experienced specialist surgeon to perform this procedure competently. Maybe a 2-3 day weekend style Slocum TPLO course would achieve this. The nuances of ensuring that collateral tension is sufficient and balanced is critical to a functional outcome. The surgical approach in a fibrotic stifle is challenging and dissection of a normal stifle is dissimilar. Dr. Bill Liska’s Vet Surg article on the surgical instrumentation and technique are detailed and useful to aid in mastering this procedure.

Selection criteria:

There are parameters that enable us to determine which cases would make a suitable candidate. If you feel that the degree of degenerative change is causing the majority of the pain / disability in a stable knee, TKR may be the better option over a reconstructive alternative (TPLO, TTA, extracapsular reconstruction). In addition, we all appreciate that it is ideal to regularly perform any procedure to become proficient as well as maintain our skills. In other words, if you aim to become a TKR surgeon, try to either build a waiting list, combine your cases with another surgeon to have a larger pool of cases and become proactive about recruiting suitable cases rather than waiting for the perfect candidate.

Classic indications: advanced osteoarthritis due to ACL disease, OCD, trauma, MPL.

Contraindications: Collateral ligament insufficiency, infection, fractious patient temperament, neoplasia, limited periarticular fibrosis, gross limb malalignment

Approximately half of our cases were performed in ‘virgin’ joints that had no prior surgery and had OA secondary to chronic ACL disease. I believe that the technique is simpler and the success rates higher. The other cases had been infected post extracapsular ACL, had a failed extracapsular ACL reconstruction, failed high tibial osteotomy (CWO), failed MPL surgery or had chronic OCD.

If you have a higher degree of confidence with a certain ACL reconstructive procedure in an arthritic stifle than you do with this newer treatment option, you will likely bias your discussion with the client towards what you know and are comfortable with. TKR involves a bold decisive decision to try something new knowing that some of the complications will result in high morbidity and possibly no salvage option other than amputation. A similar scenario exists for elbow replacement surgery.
**Surgical Technique:**

The patient is positioned in dorsal recumbency at the end of the operating table. The surgeon works off the end of the patient table to allow intraoperative assessment of limb alignment and access both sides of the limb. Craniomedial and craniolateral approaches can be used with equal exposure. I recommend a craniolateral approach due to familiarity, avoidance of the *sartorius* muscle group and the ability to imbricate the lateral fascia if required. I use a double layer material-plastic orthopedic stockinette which is sutured to the dermis to limit operative wound contamination.

There are two jigs used to make tibial and femoral cuts. Each attaches to the respective bones using either pins or 2.0mm drill bits. Adequate exposure for the tibial cut requires entering the bursae of the patellar tendon insertion upon the tibial tubercle and reflection of the quadriceps mechanism. The ideal tibial cut is shallow rather than steep preserving height caudally. This will ensure the knee fully extends and the joint is not loose in flexion, both of which are important. The tibial cut should be deep, fully resecting the convex tibial condyles caudally. This will allow more caudal placement of the tibial implant which will help maintain collateral ligament tension. The femoral cutting guide is easy to use and consistently enables problem free femoral component placement.

The goal is to place a set of components which allows resistance-free extension without valgus or varus laxity in either extension or flexion. The surgeon needs to be familiar with strategies to address each of these issues (intraoperatively) by resecting more bone or using a different implant. Failure to achieve a stable knee ‘on the table’ will translate into immediate complications.

I have not used any form of drains to extract fluid / blood in the first several hours after surgery (vs. humans). An adhesive wound dressing is used to protect the surgical wound. I have not used RJ dressings or bracing routinely. Icepacks can be used to reduce swelling in the immediate postoperative period. Some dogs with significant knee pain will require aggressive active and passive physical therapy to encourage limb use and stifle extension.

**Complications:**

Dr. Marvin Olmstead, a respected THR surgeon, once said ‘If you are not prepared to deal with the complications of hip replacement surgery, do not do them’. The same can be said for knee replacement surgery in dogs. I have managed medial and lateral collateral ligament rupture, aseptic loosening, infection, patellar luxation and ‘knee pain’.

I am unsure at this stage if the high number of complications are a result of poor case selection, inadequate technique or a failing of this procedure in dogs. I suspect the former as three of the five medial collateral ruptures were likely due to overzealous operative dissection medially, the aseptic loosening was due to insufficient patient size and the patellar luxation occurred in a chronic MPL with distal femoral varus.