Medical Opinion – Alexander XXXXX
DOB: 06/22/YYYY

Opinion - Question and Answers:

1. **What was the surgery done on 11/17/YYYY to Mr. XXXXX when he presented to Dr. Alan XXXXX?**

   Mr. XXXXX presented with aseptic loosening of the knee prosthesis, which was operated in YYYY for osteoarthritis left knee. He was evaluated on 04/12/YYYY and infection was ruled out on 06/27/YYYY. The surgery that had been performed was a revision total knee arthoplasty with Smith & Nephew total knee prosthesis and the details of the prosthesis are as follows:

   The femur #6 left Oxinium PS legion revision femur with a 22 x 100 60 mm stem, tibia is a #6 left revision tibial tray with an 18 x 120 mm stem and 2 mm offset, and a spacer is a 21 mm constrained stem.

2. **What was the outcome of the surgery performed on 11/17/YYYY? Did the patient have any complication?**

   The outcome from the surgery was **very poor** as the patient developed pain and swelling left knee which was evaluated by X-ray left knee on 03/05/YYYY. It was found that there was posterior translation of tibia over femur.

   The patient developed **flexion instability** of the revised knee prosthesis and needed another surgery to correct the flexion instability.

3. **Was there any deviation in the standard of care with regard to the surgery performed on 11/17/YYYY?**

   Yes. There was deviation in the standard of care given by Dr. Alan XXXXX in the choice of replacement device and the technique used.

   The cause for the early instability following revision TKR was probably due to mal-alignment of the components, failure of restoration of the mechanical axis of the limb, and improper balancing of the flexion–extension space **Ref-1**. The surgeon had removed excessive part of distal femur and inserted thicker tibial insert. A thicker tibial insert would not lead to elevation of the joint line. Marked elevation of the joint line limits knee flexion, affects patellar function, and contributes to mid-flexion instability **Ref-2**, **Ref-3**, **Ref-4**.

   All these factors are surgeon related and the instability could have been prevented if the surgeon had augmented the femoral prosthesis and used hinged knee prosthesis Ref-5.

   He should have taken precaution while balancing the soft tissue and also restoring the mechanical axis.

4. **What was the surgery done on 03/05/YYYY for the flexion instability of revised knee prosthesis? Was there any deviation in the standard of care by Dr. Alan XXXXX here? What was the outcome?**

The surgery performed was exchange of polyethylene insert to 30mm from 21mm insert.

Yes, there was deviation in the standard of care as the ideal surgery would be to revise the prosthesis with hinge type knee prosthesis that could prevent gross instability. During surgery, it was found that the knee prosthesis had instability in varus and flexion with flexion gaps more than extension gaps. This instability could not be corrected by only tibial insert exchange as this would compromise further the knee mechanics **Ref-3, Ref-4, Ref-7.** The outcome would be very poor, which was evident by the fact that the patient again developed instability of the knee in flexion and varus. He also developed surgical site infection that got resolved by antibiotics.

5. Was there any deviation in the standard of care performed by Dr. XXXXX?

Mr. XXXXX underwent left knee revision on 10/23/YYYY done by Dr. Jose XXXXX. The outcome was good as there is no instability as per last available record of 02/15/YYYY. There was no deviation in the standard of care.

6. Was there an untreated infection?

On reviewing the records, we note that the patient developed infection only after the second surgery on 03/05/YYYY. He was subsequently treated with antibiotics. Culture report of knee fluid aspiration was found to be negative as of 08/23/YYYY. Hence, we feel that the treatment of infection was appropriate.

7. What are the damages that the patient suffered because of the deviation in the standard of care given by Dr. Alan XXXXX?

- Chronic pain.
- Instability of the joint.
- Repeated hospitalization and multiple surgeries.
- Financial loss due to repeated surgery.
- Psychological disturbances due to repeated hospitalization.

To conclude,

Dr. Alan XXXXX had breached the standard of care in both the surgeries performed by not taking precaution while balancing the soft tissue and restoring the mechanical axis on 11/17/YYYY; not considering the femoral prosthesis and hinged knee prosthesis on 03/05/YYYY.

References:

Ref-1:

http://www.ncbi.nlm.nih.gov/pmhatc/articles/PMC3192893/

Instability Following Total Knee Arthroplasty

E. Carlos XXXXX, M.D., Ph.D.

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Early instability is that which occurs relatively early (weeks to months) after TKA. The etiology of these early symptoms is multiple. Early instability is typically caused by malalignment of the components, failure of restoration of the mechanical axis of the limb, improper balancing of the flexion–extension space, rupture of the posterior cruciate ligament (PCL) or medial collateral ligament (MCL), and patellar tendon rupture or patella fracture.

Ref-2:

http://www.mdconsult.com/das/article/body/420025928-5/jorg=clinics&source=MI&sp=25493704&sid=1463685503/N/1094428/1.html?issn=0749-0690

Revision Total Hip and Knee Replacement
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Revision Total Hip and Knee Replacement Andrew XXXXX, MRCS (Ed), FRCS (Trauma & Orth)Andrew XXXXX, MSc, FRCS (Trauma & Orth), FRCS (Ed)

Dislocation/Instability

The dislocation rate after primary THR is reported to be 1% to 3% (Fig. 2). The etiology of dislocation may be classified as patient related, surgeon related, and implant related. Rates of dislocation are highest within the first 3 months after surgery. When dislocation becomes recurrent, revision surgery often becomes necessary. The initial treatment is with closed reduction then treatment in a brace. After a second or third dislocation, patients are normally offered revision surgery, and constrained acetabular components can be used, which reduce the risk of further dislocation.

Dislocation after TKR is fortunately a rare occurrence. Instability, however, is increasingly recognized as a mode of failure and can be very disabling. The main options for treatment of instability are isolated polyethylene spacer exchange or full component revision using a more constrained knee replacement or hinged knee. Constrained implants help stabilize the knee in 2 planes. They provide antero-posterior (AP) as well as varus/valgus stability and are used mainly in cases of collateral

ligament insufficiency. Hinged knee replacements are generally used in cases of instability associated with significant bone loss in addition to collateral ligament insufficiency. Fig. 3 illustrates the differences between primary TKR and hinged knee replacement components. Periprosthetic fracture data from the Swedish Hip Registry has shown that after THR, periprosthetic femoral fractures were the third most common cause for reoperation (9.5%) after aseptic loosening (60.1%) and recurrent dislocation (13.1%).[4] These fractures may occur intraoperatively or postoperatively. Intraoperative fractures are more likely to occur when using uncemented implants (Fig. 4). Meek and coworkers[5] report the overall rate of fracture was 0.9% after primary THR, 4.2% after revision THR, 0.6% after primary TKR, and 1.7% after revision TKR. The femur is much more commonly fractured in both THR and TKR. Postoperative fractures may occur after major trauma or more commonly as a result of minor trauma in combination with osteoporosis or loose implant.

Ref-3:

http://www.ncbi.nlm.nih.gov/pmhatc/articles/PMC3192893/

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Managing isolated excessive bone removal from the distal part of the femur can be challenging. A thicker tibial insert will not solve this problem and leads to elevation of the joint line and excessively tightens the flexion space resulting in the potential for achievement of poor post-op flexion and patellar maltracking. Marked elevation of the joint line limits knee flexion, affects patellar function, and contributes to midflexion instability. In this situation, the solution requires the addition of distal femoral augments.

Ref-4:

http://books.google.co.in/books?id=4j6lCQ5iLxwC&pg=PA446&dq=Instability+of+knee+after+TKR&hl=en&sa=X&ei=tjUDUrzbBYTrrQfQlYCQBA&ved=0CFcQ6AEwBQ#v=onepage&q=Instability%20of%20knee%20after%20TKR&f=false

Revision Total Hip and Knee Arthroplasty

By Daniel XXXXX, Robert XXXXX, Douglas XXXXX, Wayne XXXXX

Flexion Instability Flexion instability is the final outcome of any process that leads to a substantial mismatch between the extension gap and the flexion gap, with the flexion gap larger than the extension gap. Such processes include overresection of the posterior femoral condyles, sagittal tibial resection with excessive posterior tibial slope, and early or late failure of the posterior sacrificing (PCL) in cruciate-retaining knees.[29] This diagnosis is most commonly seen in cruciate-retaining TKA. In the case of posterior cruciate substituting TKA, the femoral cam-tibial post mechanism provides posterior tibiofemoral stability. However, when there is an excessively large flexion gap, the femoral component can actually dislocate anteriorly by "jumping" the tibial post.[32,33]

Flexion instability usually presents in a less dramatic fashion than frank dislocation. The Mayo Clinic series of flexion instability in cruciate-retaining knees[28] described a constellation of findings that includes pain, recurrent swelling, generalized knee tenderness, and a sense of instability. During the physical examination, special attention should be given to the assessment of PCL function. Special tests include the quadriceps active test, evaluation for posterior sag, and the anterior and posterior drawer tests. These authors describe a test for flexion instability where the patient sits with the knee flexed and the foot resting on the floor. By relaxing the stabilizing muscles, the AP translation of the tibia on the femur can be better assessed.

Surgical options for the treatment of flexion instability include polyethylene liner exchange in modular implants, and revision TKA to a more conforming polyethylene insert, a PS design, or a more constrained design such as a constrained condylar knee or even a hinged prosthesis.

Isolated polyethylene liner exchange does nothing to address gap mismatch, unless the patient truly had an undersized liner and initial global instability. For this reason, this procedure produces highly unpredictable results and should be performed only rarely.[29] In a series of 55 patients (56 knees) undergoing isolated tibial insert exchange at the Mayo Clinic,[34] 27 inserts were exchanged in an attempt to treat painful ligamentous instability. This included 14 knees with collateral instability, 9 knees with global instability, and 4 knees with AP instability. Twelve of the twenty-seven knees (44%) had failed at a mean of 3 years from the insert exchange. Patients with global instability fared the worst.

When flexion instability presents following cruciate-retaining TKA, revision to a PS design is very effective. Revision to a PS design was the most predictable operation in a series of patients treated for flexion instability at the Anderson Orthopedic Research Institute.[29] In the Mayo Clinic series,

Ref-5:

http://www.ncbi.nlm.nih.gov/pmhatc/articles/PMC3192893/

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Instability of the knee can be prevented in most cases with an adequate selection of implants and a good surgical technique. Preoperative physical examination allows for evaluation of the state of the LCL, MCL, and PCL in order to select the adequate implant for each patient.

Ref-6:

Risk Factors and Prevention

Some patients are prone to instability. Those who have greater preoperative deformities, especially if compounded by extra-articular deformity or dynamic aberrations of gait, require large surgical corrections and aggressive ligament releases and may be difficult to stabilize [16].

Several factors can produce instability after total knee replacement (Table 1). Specific patient-related risk factors are a large surgical correction including an aggressive ligament release, general or regional neuromuscular pathology (quadriceps weakness inducing recurvatum or weak hip abductors that impart a medial thrust to the knee), hip or foot deformities typified by posterior tibial tendon rupture and pes planus. These deformities induce valgus moments at the knee. Clinical obesity is also a risk factor because it complicates surgical exposure, jeopardizes the collateral ligaments (8% incidence of avulsion of the medial collateral ligament in obese patients) and makes it difficult to appreciate component position [16].

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3192893/table/Tab1/

Table 1

Main causes of knee prosthesis instability (KPI)

Ligament imbalance
Component disalignment
Component failure
Implant design
Mediolateral instability
Bone loss from over resection of the distal femur
Bone loss from femoral or tibial component loosening
Soft tissue laxity of the medial and lateral collateral ligaments
Connective tissue disorders (rheumatoid arthritis or Ehlers–Danlos syndrome)
Inaccurate femoral or tibial bone resection
Collateral ligament imbalance (under release, over release, or traumatic disruption)

Ref-7:

http://www.ncbi.nlm.nih.gov/pmhatc/articles/PMC3192893/

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PS implants should be utilized in those patients with PCL insufficiency and in those with increased risk of posterior instability (rheumatoid arthritis, previous patellectomy, or the need to resect the PCL to correct a ligamentous imbalance, flexion contracture, or previous tibial osteotomy). If the choice is made to preserve the PCL, it is important to take special care in maintaining its integrity when the tibial cut is made. In case of doubt, it is preferable to convert the arthroplasty to a PS design. Careful attention to the balance of soft tissues and the correct implantation of the components in every plane, including the rotation of the femoral component, is essential to achieve symmetric spaces on flexion and extension. In some patients with marked instability (knee with valgus and complete insufficiency of the PCL, poliomyelitis, or Charcot arthropathy), a primary constrained or linked hinge implants may be indicated.

Go to: Thus, for a PS implant to succeed, a functional soft tissue envelope is needed to provide varus–valgus stability. However, the need for good flexion–extension balancing is also important because a residually loose flexion space can result in posterior tibio-femoral dislocation.

The next level of constraint is non linked hinge implant such varus–valgus constrained (VVC) or constrained condylar knee (CCK). Such components provide a significant degree of rotational control and more significantly a great deal of constraint to varus–valgus angulation. The trade-off is the theoretical disadvantage of increased stress transmission to the component–bone interfaces. Because these implants limit varus–valgus angulation between the femoral and tibial components, it would seem intuitive that they could be used in cases of severe medial or lateral instability. One must not forget that flexion instability is still a limitation for these implants [14].

With the absence soft tissue support or in the presence of gross flexion extension instability, linked hinge components are indicated [2]. Unfortunately, disappointing results have historically been associated with these implants predominantly because of implant loosening, significant patellar pain and high infection rates. However, newer rotating hinge designs have produced more encouraging clinical and radiographic results [2, 14, 17] (Fig. 3).

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