



SCOTnet

Scottish Collaborative Orthopaedic Trainee Research Network

Provision of revision total knee arthroplasty across Scotland: a national audit

<http://www.scotorth.com/scotnet/>

Study proposal

Background

Revision total knee arthroplasty (rTKA) represent a challenging procedure that requires a highly experienced surgical team who are familiar with the technique and equipment. There is increasing evidence that low case volumes for individual surgeons and centres are associated with poorer outcomes for those undergoing revision rTKA ^{1,2}. Given that outcomes following rTKA are less reliable than that of primary TKA ³, centralisation of complex cases in to fewer high volume centres offers a theoretical advantage. Accordingly, a network reconfiguration is currently underway within England and Wales to reorganise provision of rTKA in order to centralise services and maximise available expertise for cases.

Similar proposals are under discussion within Scotland, but due to differences in funding mechanisms and regional geography, the provision of rTKA networks may require an alternative approach to the current hub and spoke model planned for other UK nations. As such, understanding details on the complexity of cases (above what the Scottish Arthroplasty Project holds) performed within individual units, and by individual surgeons, is required to appropriately guide development of the future networks and improve the delivery of rTKA services. The aim of this project is therefore to develop an insight in to the current delivery of rTKA across Scotland at a regional, local and individual surgeon level.

Methods

A retrospective review of all rTKA cases performed across Scotland in 2019 will be undertaken. Only cases that were undertaken from 01/01/2019 to 31/12/2019 should be included. The individual units by region that perform rTKA are presented in Table 1.

Each region will have a regional trainee lead to co-ordinate running of the project and return of the completed data collection forms – the “regional lead”. The regional leads will seek to identify a trainee and Consultant lead at each participating hospital – the “local leads”. Up to a total of 5 local collaborators may also be identified for data collection, but each collaborator must include data from a minimum of 5 patients to the audit to qualify for authorship. All contributions from relevant parties will be recognised for authorship as part of the Scottish Collaborative Orthopaedic Trainee Research Network. For further details regarding the approach to collaborative authorship please see

<https://www.sciencedirect.com/science/article/pii/S174391911731498X?via%3Dihub>.

Registration with the local hospital audit & quality improvement teams is encouraged but not mandatory for participation.

For the purposes of the study rTKA is defined as 1) revision of unicompartmental knee replacement (UKR), 2) debridement, antibiotics and implant retention (DAIR) for acute infection, 3) one stage rTKA, 4) 1st stage of two stage rTKA, 5) 2nd stage of two stage rTKA, 6) megaprosthesis for non-tumour surgery, or 7) revision surgery for periprosthetic fracture or non-union.

Table 1: List of units performing rTKA across Scotland. Note there may some differences between typical regional hospital pairings.

West region	East region	South east region	North region
Golden Jubilee National Hospital	Ninewells Hospital	Royal Infirmary Edinburgh	Raigmore Hospital
Queen Elizabeth University Hospital	Perth Royal Infirmary	Victoria Hospital Kirkcaldy	Woodend Hospital
Glasgow Royal Infirmary		Queen Margaret Hospital Dunfermline	Aberdeen Royal Infirmary
Inverclyde Royal Hospital		Borders General Hospital	
Royal Alexandria Hospital		Forth Valley Royal Hospital	
University Hospital Hairmyres			
University Hospital Crosshouse			
University Hospital Ayr			

Patient age, sex, American Association of Anesthesiologist (ASA) score and month of surgery will be collated. **Each case will be provided with a study ID which will be matched to the patient CHI number and held locally to ensure no identifiable information is shared. Similarly, an ID number for the operating consultant will be produced to ensure surgeon anonymity and held locally.** To grade case complexity, the Revision Knee Complexity Classification (RKCC) ⁴ will be utilised. This is a validated method of assessing the rTKR complexity based on bone defects, patient factors, presence of infection and soft tissue integrity. Full details are presented in Appendix 1. All data will be collated on a standardised Excel spreadsheet with no identifiable patient or surgeon information.

Analysis

Following data collection, RKCC details will be grouped at a regional, local and individual surgeon level. Current service provision will be compared to rTKA national standards set out in the BOAST guideline “Revision Total Knee Replacement Surgical Practice”⁵ which was produced by the BOA and BASK. Predicted optimal future individual surgeon and unit volumes will be calculated based on RKCC details and BOAST recommendations for the case complexity undertaken at individual centres (local or regional). The highest volume centre within each region will be recommended as the regional unit for calculation purposes. The data collected will also be compared to that collated through SAP to examine the effectiveness of SMR01 data as a tool for monitoring of revision knee practices.

Appendix 1

Revision Knee Complexity Classification

Anderson Orthopaedic Research Institute Classification of Bone Defects Grade (AORI)

Femur:

- F1/F2a/F2b/F3 (see table 2)

Anderson Orthopaedic Research Institute Classification of Bone Defects Grade (AORI) Tibia:

- T1/T2a/T2b/T3 (see Table 2)

Patient Comorbidities - McPherson Systemic Host Grade:

- A/B/C (see Table 3)

Infection:

- Yes/No

Extensor mechanism compromise:

- Yes/No

Required intra-operative soft tissue coverage/reconstruction:

- Yes/No

Overall Classification:

- R1/R2/R3 (see table 4)

Table 2: Anderson Orthopaedic Research Institute (AORI) classification of bone defects ⁶.

Type 1	Minor femoral or tibial defects with intact metaphyseal bone, not compromising the stability of a revision component
Type 2	Damaged metaphyseal bone. Loss of cancellous metaphyseal femoral bone requiring reconstruction to provide stability of the revision component
2A	Defect in one femoral or one tibial condyle
2B	Defects in both femoral or both tibial condyles
Type 3	Deficient metaphyseal segment compromising a major portion of either femoral condyles or tibial plateau, occasionally associated with collateral or patellar ligament detachment

Table 3: McPherson Systemic Host Grade ⁷

A: uncompromised

B: compromised (1–2 compromising factors)

C: significant compromise (>2 compromising factors) or one of:

Absolute neutrophil count <1000

CD4 T cell count <100

Intravenous drug abuse

Chronic active infection at another site

Dysplasia or neoplasm of immune system

Compromising factors:

Age > 80

Immunosuppressive drugs

Alcoholism

Malignancy

Chronic active dermatitis or cellulites

Pulmonary insufficiency

Chronic indwelling catheter

Renal failure requiring dialysis

Chronic malnutrition

Systemic inflammatory disease

Current nicotine use

Systemic immune compromise

Diabetes

Hepatic insufficiency

Table 4: revision level based on RKCC classification.

R1 (Revision 1)—less complex revision surgery

- Primary/unicompartmental TKA—aseptic loosening, simple instability, revision of partial to total knee replacement, or polyethylene exchange
- AORI 1 or 2A bone loss (no requirement for supplemental metaphyseal fixation)
- Debridement with antibiotics and implant retention (DAIR) for acute infection
- No significant confounding factors or PIES (patient factors, infection, extensor or soft-tissue compromise)

R2 (Revision 2)—complex revision surgery

- AORI 2B—bone loss requiring supplemental metaphyseal fixation e.g. cones or sleeves
- Re-revision operations
- Stiff knees for revision that may require enhanced exposure techniques such as tubercle osteotomy
- Revision for first-time infection
- Revision for femoral periprosthetic fracture around primary implant
- Complex instability—where correction of the joint line to achieve stability may require the use of cones or sleeves with or without large augments
- Includes R1 cases with significant confounding factors or PIES (patient factors, infection, extensor or soft-tissue compromise)

R3 (Revision 3)—most complex and salvage cases

- Multiple previous revisions

- AORI 3—balance of massive prosthesis ± metaphyseal reconstruction
- Requires hinge for massive bone loss ± ligament instability
- Revision for periprosthetic fracture around stemmed implant or non-union
- Recurrent Infection after previous revision surgery
- Consideration for salvage: arthrodesis, amputation or suppression therapy

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