



Revision arthroplasty: the effect on renal function

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Revision arthroplasty surgery is complex with increased risk of complications for patients following such procedures. This study aims to review if complex revision surgery places these patients at risk of significant renal impairment which can be a significant cause of morbidity and in some cases mortality in surgical patients.

A retrospective review of 50 patients and 68 total procedures was performed. Patient demographics, indications for revision, post-operative course and complications were recorded. Their pre-operative and post-operative renal function was reviewed.

Revision for infection was most common with 20 cases (30%), followed by aseptic loosening in 14 cases (20%). Sixteen cases developed renal dysfunction in the post-operative period with five of these cases requiring specialist renal consultation, however the majority resolved under the care of the surgical team without significant sequelae for the patient in question.

This study demonstrates that while complex revision arthroplasty may cause mild renal dysfunction in a small cohort of patients, this tends to be of short duration and can be managed successfully in the majority of instances by the surgical team.

Keywords Total hip arthroplasty ; revision ; renal.

both in terms of clinical outcomes as well as cost-effectiveness (1). With an ageing population worldwide, the number of patients undergoing primary hip and knee arthroplasty continues to increase. Inevitably therefore, the rate of revision hip arthroplasty and revision knee arthroplasty will continue to grow (11,13). In fact, the number of revision procedures almost doubled for revision hip surgeries and tripled for knee surgeries between 1990 and 2002 (10). Looking toward the future, projections from the US in 2015 estimate that revision THA will increase by 601% and TKA by 17% by 2030 (11).

The literature indicates that aseptic loosening is the primary indication for revision (52-55%), followed by instability (14-16%) and infection (5.5-7%), with periprosthetic fracture and implant fracture also indications for revision (2,16).

These are complex procedures which can have a variable post-operative course. A number of studies have investigated risk factors for readmission and increased length of stay after revision joint arthroplasty. These include diabetes with end-organ

INTRODUCTION

Total hip arthroplasty (THA) and total knee arthroplasty (TKA) are very effective operations for patients with degenerative joints conditions,

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dysfunction, cardiac valvular disease, smoking history, fluid/electrolyte imbalance (history of renal disease), coagulation disorders (1,9-10,14). Indeed, patients with chronic kidney disease/end-stage renal disease (ESRD) are at increased risk of post-operative complications compared to those without kidney disease. Studies show evidence of increased rates of deep wound infections, DVT, pneumonia, decubitus ulcers, and mortality. And this risk is increased if the patient requires dialysis prior to their operation (4).

While pre-operative renal dysfunction is a risk factor for complications, studies have also shown that acute post-operative renal dysfunction can also lead to increased length of stay, morbidity, mortality and increased cost of treatment (5,6). Patients at risk of post-operative renal dysfunction include those of advanced age, and those with hypertensive disease and high ASA score (12).

This study aims to review the renal function in patients who underwent revision hip or knee arthroplasty to determine if such procedures place these patients at risk of renal dysfunction in the post-operative period and how such patients were managed and their outcomes thereafter.

METHODS

A retrospective study was performed which included a consecutive cohort of patients who underwent revision of THR or TKR by a single surgeon in a single institution between 2013 and 2016. A total of 50 patients and 68 total procedures were included. Patient demographics, indications for revision, post-operative course and complications were recorded. Their pre-operative and post-operative renal function were reviewed.

RESULTS

50 patients underwent 68 procedures over the period of review. 42 patients had revision THA (84%) with 8 (16%) undergoing revision surgery for TKA. 27 (54%) patients were male and 23 (46%) were female. The average age of patients undergoing a revision procedure was 67 years old (maximum - 86, minimum - 25). The average

Table 1. — Indications for primary arthroplasty procedure

Indication for Primary Procedure	Number
Osteoarthritis	43
Avascular Necrosis	4
Trauma	5

Table 2. — Indications for revision arthroplasty

Indication for Revision	Number
Aseptic Loosening	14
Infection	20
Periprosthetic Fracture	11
Dislocation	7
Broken Implant	3
Revision of Birmingham Implant	4
Wound Breakdown	1
Notes not Clear	8

period between primary operation and revision was 8.7 years (maximum - 27, minimum - 1). The most common indication for the primary procedure was degenerative osteoarthritis followed by trauma and avascular necrosis (AVN) as seen in Table 1 below.

Reviewing the revision cases, infection was the most common cause for revision arthroplasty (29%), followed by aseptic loosening (21%) and periprosthetic fracture (16%). Other indications included recurrent dislocations and broken implants (Table 2).

17 (34%) patients developed renal dysfunction in the post-operative period. Six of these patients required specialist review from either our nephrology or endocrinology colleagues. Only one patient required dialysis in the post-operative period however this gentleman had end-stage renal disease prior to his procedure and was on dialysis for this. Fortunately, all were managed in the same centre due to their operation being undertaken in a large multi-speciality academic hospital.

The 11 patients who did not require specialist review were managed at a ward level by the junior doctors of the orthopaedic service. All patients returned to their baseline for renal function as assessed prior to their procedure.

Reviewing length of post-operative stay, patients who developed post-operative renal dysfunction had a median length of stay of 14 days when

Table 3. — Duration of post-operative stay for all patients

Duration of Post-Op Stay (Days)	
Median	10
Average	20
Maximum	237
Minimum	3

Table 4. — Renal disorders developed by patients post-operatively

Renal Disorder	Number
Developed AKI	10
Hypokalemia	3
Hyponatremia	3
ESRD	1
Total	17

Table 5. — Number of patients requiring specialist review

Specialist Consultation	Number
Renal	5
Endocrine	1
Required Dialysis	1

compared to 9 days for those whose renal function was unimpaired.

35% of patients who developed post-operative renal dysfunction also developed another complication including delirium, pneumonia, and atrial fibrillation. This is in comparison to 23% of patients who maintained normal renal function during their peri-operative course.

DISCUSSION

Reviewing the literature, there has been significant research into the benefit of higher volume centres, both in terms of surgeon case load and hospital case load, for patients undergoing arthroplasty surgery. In hospitals with higher volume of cases and for surgeons who perform a large number cases each year, outcomes for patients are improved, with reduced mortality and lower complication rates (3,8). This has coincided with the introduction and further expansion, within the US and Europe, of speciality hospitals, including those focusing on orthopaedic procedures. While these hospitals offer the benefit of high volume, specialised care, there has been concern that such centres focus on low-risk patients

and therefore complex patients, such as those with significant co-morbidities, do not benefit from the development of such specialised units (3). These patients are still operated on in large academic centres with multi-specialty support, which allows for optimisation of medical co-morbidities pre-operatively, as well as multi-disciplinary input post-operatively if required.

Patients with co-morbidities as well as those who develop complications in the post-operative have been shown in the literature to have poorer outcomes following both primary and revision arthroplasty procedures (10,14). This study demonstrates that patients who develop renal dysfunction in the post-operative period have a longer median length-of-stay as well as being at a higher risk of developing other complications.

Abnormal renal function can prove challenging to manage appropriately and may require specialist intervention in some instances. This was seen in the cases of 6 of the patients reviewed. However, this study demonstrated that the majority of post-operative renal dysfunction is mild in nature and may be managed appropriately by generalists and junior doctors with swift return to baseline function.

This study would support the careful assessment and monitoring of renal function in the post-operative period to ensure appropriate action is taken up to and including the involvement of specialist physicians when renal dysfunction occurs as it leads to poorer outcomes for patients in the immediate to medium-term. Further follow-up studies will be required to determine the long-term effects of such dysfunction in this patient cohort.

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