Original Article

Hip Joint Replacement

Risk Factors for Renal Dysfunction after Total Hip Joint Replacement in One Territory Care Hospital in Peshawar

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ABSTRACT

Objective: The objective of our study was to identify the possible risk factors for renal dysfunction after total hip joint replacement surgery.

Study Design: Observational cohort study

Place and Duration of Study: This study was conducted in Orthopedic Department of Lady Reading Hospital, Peshawar from March 2013 to February 2014.

Materials and Methods: A study was conducted among 212 consecutive primary hip joint replacements performed. According to the RIFLE criteria, increased postoperative serum creatinine was considered indicative of postoperative renal injury.

Results: Eighty-one patients (14.1 %) had significant moderate or severe postoperative renal dysfunction in which 4 patients (1.9 %) acquired severe and permanent renal impairment.

Conclusion: We identified advanced age, hypertension, general anesthesia, high ASA scores, low intra-operative systolic BP, and prophylactic dicloxacillin as significant risk factors. Smoking, diabetes mellitus, high BMI, gender, and duration of surgery were not identified as significant risk factors.

Key Words: Risk Factors, Renal Dysfunction, Hip Joint Replacement

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INTRODUCTION

Total hip joint replacement is indicated mainly for hip osteoarthritis, for complications after osteosynthesis of hip fractures, and for the treatment of femoral neck fractures in relatively young patients. Possible complications are deep venous thrombosis [1–3] infection [4–6] dislocation of the hip prosthesis [7, 8] and increased creatinine levels, and impaired renal function [9–11] the latter may in turn increase mortality and morbidity among patients who are already affected by diseases such as diabetes mellitus, hypertension, heart disease, and obesity [12–16]. Increased hospital stay, morbidity, mortality, and increased cost may all be consequences of acute postoperative renal dysfunction. To date, preventative strategies are the only effective measures to reduce morbidity in cases of postoperative renal dysfunction. Therefore, in order to influence our guidelines, it is imperative to identify the risk factors of renal dysfunction after total hip joint replacement surgery. In our department, the protocol for elective total hip joint replacement surgery includes measuring serum creatinine; once preoperatively and three consecutive days postoperatively. Increased postoperative serum creatinine was monitored and controlled daily until it decreased or the patient was referred to the nephrology department. During the first postoperative week, the highest serum creatinine was chosen as a sign for maximum renal injury. Dicloxacillin was the antibiotic of choice for prophylaxis and cefuroxime used as the alternative in cases of allergies to penicillin.

The aim of this study was to identify patients with renal injury after total hip joint replacement and to detect possible risk factors and their clinical relevance in our retrospective material of 212 consecutive total hip joint replacements. In recent years, a few studies identified renal impairment as a complication to be considered after major surgery [17–21].

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MATERIALS AND METHODS

This study was conducted at orthopedic department of Lady Reading Hospital, Peshawar from March 2013 to February 2014. Indications for surgery were primary osteoarthritis ($n = 195$), femoral neck fractures, and complications after osteosynthesis of hip fractures ($n = 17$). A total of 212 patients with a total of 212 hip joint replacements were included. Data was obtained from our computerized database and hospital charts.

Charts were reviewed for at least 9 months after surgery. Out of the 212 total hip joint replacements, 82 had complete data sets matching our investigation criteria. The following variables were selected [17, 18]: age, sex, body mass index (BMI), hypertension, diabetes mellitus, smoking, American Society of Anesthesiologists (ASA) physical status, prophylactic antibiotics according to our protocol (one dose immediately preoperatively and three doses in the first postoperative day), duration of surgery, type of anesthesia, baseline systolic blood pressure (BP), baseline diastolic BP, intra-operative systolic BP, and intra-operative diastolic BP (lowest measured blood pressure intra-operatively).

RESULTS

During the study, 30 out of 212 patients had significant moderate or severe renal impairment (RIFLE ≥ 1.5) resulting in an overall incidence of 14.1 % Table 1. Seventeen patients (8.0 %) had RIFLE 1.5–2, 7 patients (3.3 %) had RIFLE 2–3, and 6 patients (2.8 %) had RIFLE ≥ 3. Out of these 30 patients, 26 improved but 04 patients acquired severe and permanent renal impairment (i.e., in dialysis) with an incidence of 1.9 % Table 2. Three patients had postoperative serum creatinine above the defined failure limit (354 µmol/l). This was not correlated with a higher preoperative serum creatinine. The one patient with high preoperative serum creatinine was already above 200 µmol/l. The renal status of the 30 patients was observed through electronic charts for at least 9 months after surgery.

Table 3 reveals advanced age, hypertension, general anesthesia, high ASA scores, low intra-operative BP, and using prophylactic dicloxacillin as being significant risk factors for renal impairment, after total hip joint replacement on univariate analysis.

Generalized multivariate modeling was performed using the relative change in serum creatinine as a dependent variable. It confirmed that advanced age, hypertension, general anesthesia, prophylactic dicloxacillin, low baseline systolic and diastolic BP, and having a hip fracture diagnosis were significant independent risk factors for a rise in serum creatinine (Table 3).

BMI, duration of surgery, gender, diabetes mellitus, and smoking were not considered significant risk factors.

Table No.1: Percentage of Renal Dysfunction after Total Hip Joint Replacement

Sr.No	Renal dysfunction	Patients	Percentage
1	Severe postoperative renal dysfunction	30	14.1
2	Percentage of renal dysfunction	04	1.9

Table No.2: Percentage RIFLE for Renal Dysfunction After Total Hip Joint Replacement

Sr.No	Patients	RIFLE	Percentage
1	17	1.5-2	8.01
2	07	2-3	3.31
3	06	73	2.8

Table 3: Significant and Non- Significant Risk Percentage of Renal Dysfunction After Total Hip Joint Replacement

Sr.No	Significant Factors	Non- Significant factor
1	Age	Smoking
2	Hypertension	Diabetes mellitus
3	General anesthesia	High BMI
4	High ASA scores	Gender
5	Low Intra-operative systolic BP	Duration of surgery
6	Prophylactic dicloxacillin	

DISCUSSION

Increased hospital stay, morbidity, mortality, and increased cost may all be consequences of acute postoperative renal dysfunction [22, 23]. To date, preventative strategies are the only effective measures to reduce morbidity in cases of postoperative renal dysfunction. Therefore, in order to influence our guidelines, it is imperative to identify the risk factors of renal dysfunction after total hip joint replacement surgery.

In spite of the retrospective design, data was complete for most patients;. However, an important limitation was the missing information on fluid input and output which would have potential influence on renal function. Unfortunately, these charts were unreliable and had frequent missing records of blood loss during surgery. Therefore, data regarding perioperative blood loss was not collected. None of our patients had received blood transfusions perioperatively, and very few patients received blood transfusion postoperatively (<1 %) indicating minimal blood loss during surgery. Excessive blood loss during surgery may lead to decreased intra-operative BP and renal blood flow predisposing the patients to pre-renal failure. Our study shows that a higher preoperative serum creatinine is not a predictor for either a higher postoperative serum creatinine above the limit of 355 µmol/l or a higher relative change.

Our patients received prophylactic antibiotics in the form of either dicloxacillin or cefuroxime (. Those receiving the former had a significant increased risk of increased postoperative serum creatinine. Baily et al. [25], Solgaard et al. [26] and Isacson and Collert [27] developed the same conclusion in their respective studies. Dicloxacillin has been the local recommendation for many years due to the narrow bacterial spectrum

relevant to prevent infections with Staphylococcus aureus. In addition, dicloxacillin compared to cefuroxime is known to have a lower risk of complications concerning gastrointestinal problems and induction of bacterial resistance [28, 29].

The ASA score was an independent significant risk factor for the development of renal impairment, thus corresponding with the findings of Parvizi et al.[3], Abelha et al. [11], Belmont et al. [16], and Jafari et al. [17]

In our study, hypertensive disease (under treatment) had a significant increase in the risk for renal impairment as supported by Nergelius et al. [10], Naik et al. [21], and Weingarten et al. [24]. In addition, patients with low baseline systolic and diastolic BP, before anesthesia induction, also had an increased risk for renal impairment. This may be due to a reduced capacity to tolerate an additional drop in BP during anesthesia induction.

Several authors [3, 15–17, 24, 30] have indicated that high BMI was an independent risk factor after joint replacement surgery. Although our BMI range was 15 to 46, we could not confirm this finding.

Weingarten et al. [24] found that diabetes mellitus was independently associated with a high risk of developing acute kidney injury after total joint replacement, which was not the case in our study. However, Weingarten et al. [24] did not mention the actual diabetic disease control whereby our patients were meticulously controlled preoperatively.

Our study revealed a relatively high incidence of renal impairment (2.8 %) after primary total hip replacement compared to other studies [3, 17, 24]. The retrospective study conducted by Jafari et al. [17] showed an incidence of 0.55 % of acute renal failure or injury after joint arthroplasties (98 out of 17,938 joint arthroplasties including revision arthroplasties). Parvizi et al. [3] had an incidence of 0.85 % of acute renal failure in their prospective study of 1636 primary hip and knee joint replacements. The incidence was higher (1.82 %) in the retrospective study conducted by Weingarten et al. [24] which included a cohort of 9172 patients in which 167 patients showed acute kidney injury postoperatively. Nykoebing Falster Hospital serves an area of Denmark with a relatively older population and relatively low social status which would explain the higher risk of renal impairment. Therefore, it is recommended that further studies be conducted and include controlled randomization to elucidate causal factors concerning postoperative renal impairment, after major surgery.

CONCLUSION

Our study, in accordance with other studies, confirms the increased risk of renal injury after total hip joint replacement surgery. These findings may warrant a change in the protocol for informed consent as well as preoperative preparation protocols. Patients intended for total hip joint replacement may have to be informed preoperatively of any increased risk of renal impairment. High-risk patients (advanced age, hypertensive disease, and high ASA scores) should be indentified early for further optimization pre- and intra-operatively.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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