ECRONICON OPEN ACCESS

EC ORTHOPAEDICS
Research Article

Surgical Status of Orthopedic Patients Aged 70 Years and Older with a Focus on Renal Function

Hiraku Kikuchi[1,5]*, Wataru Shimada[1], Sei Mihira[1], Jin Nakajima[1], Kayoko Sumino[2], Akihiro Tan[3], Takashi Tomiyama[3], Keiko Yamada[4], Yuka Yunomae[4], Narihiro Okada[5] and Emiko Iuchi[6]

[1]Department of Orthopaedic Surgery, Sakai Sakibana Hospital, Osaka, Japan

[2]Department of Nursing, Sakaisakibana Hospital, Osaka, Japan

[3]Department of Orthopaedic Surgery, Sakibana Hospital, Osaka, Japan

[4]Department of Nursing, Sakibana Hospital, Osaka, Japan

[5]Department of Orthopaedic Surgery, Sumoto Itsuki Hospital, Hyogo, Japan

[6]Department of Nursing, Sumoto Itsuki Hospital, Hyogo, Japan

***Corresponding Author:** Hiraku Kikuchi, Department of Orthopaedic Surgery, Sakai Sakibana Hospital, Osaka, Japan.

Received: August 18, 2020; **Published:** September 29, 2020

Abstract

Objectives: We investigated renal function in patients who underwent orthopedic surgery aged 70 years and older and their surgical status at three institutions operating under different medical systems.

Methods: In 2019. We gathered the following patient data: age, sex, body mass index, disease, preoperative renal function, anemia status, use of iron administration and erythropoietin, surgical procedure, perioperative blood transfusion status, and postoperative complications.

Results: Regarding preoperative renal function of 729 surgical patients, of whom 338 aged 70 years or older, there were 141 patients out of 338 with an eGFR < 60 mL/min/1.73m2, including 29 patients on hemodialysis.

Discussion: We found that taking measures to improve anemia during the waiting period for surgery and performing transfusion with pre-storage leukocytes reduced autologous blood with intraoperative/postoperative blood salvage make it possible to respect the patient's desire to use their own unique blood for their surgery, with a low likelihood of postoperative complications.

Conclusion: Among orthopedic surgery patients aged 70 years and older, 41.7% had reduced renal function.

Keywords: *Surgical Status of Orthopedic Patients; Anemia; 70 Years and Older; Estimated Glomerular Filtration Rate; Erythropoietin; Autologous Blood*

Abbreviations

RA: Rheumatoid Arthritis; eGFR: Estimated Glomerular Filtration Rate: ESAs: Long-Acting Erythropoietin-Stimulating Agents; BMI: Body Mass Index; Hb: Hemoglobin; EPOs: Normal Erythropoietin Agents

Introduction

As a super-aged society, Japan now aims to provide medical care that takes into consideration patients as old as 100 years of age [1]. On the other hand, opportunities for surgery are increasing even for patients with poor renal function. In the past, we used estimated glomerular filtration rates (eGFRs) to measure renal function in patients with rheumatoid arthritis (RA) and those aged 70 years and older in our hospital during their outpatient visit and found that 27.0% and 41.6% these patients, had an eGFR < 60 mL/min/1.73m^2 respectively [2]. Renal anemia was a major problem in patients with chronic kidney disease, and we reported cases that used preoperative iron therapy or long-acting erythropoietin-stimulating agents (ESAs) [3]. In this study, we investigated renal function in patients who underwent orthopedic surgery aged 70 years and older and their surgical status at three institutions operating under different medical systems affiliated with Kindai University 10-year Graduate Association.

Methods

We retrospectively investigated patients who underwent orthopedic surgery aged 70 years and above at Sakai Sakibana Hospital (formerly known as Kindai University Sakai Hospital), Sakibana Hospital (an acute care hospital) and Sumoto Itsuki Hospital (a hospital with a convalescent facility) in 2019. We gathered the following patient data: age, sex, body mass index (BMI), disease, preoperative renal function, anemia status, use of iron administration and ESAs (including normal erythropoietin alfa and beta: EPO for autologous blood dosage), surgical procedure, perioperative blood transfusion status and postoperative complications.

Results

Across the three institutions, there was a total of 729 surgical patients, of whom 338 (46.4%) aged 70 years or older were included in this investigation. The subjects were 70 - 98 years old (mean: 80.6 years) and consisted of 89 men and 249 women. Their BMI ranged from 13.0 to 35.6 (mean: 22.4). Surgical procedures in 210 trauma patients were mostly bipolar hip prosthesis (manufactured by Corin: UK and Peter-Brehm: Germany) for proximal femoral fractures, balloon kyphoplasty (Teijin Nakashima: Japan) for spinal compression fractures, and intramedullary nailing (ME system: Japan) for proximal humeral fractures. Of the remaining 128 patients who underwent elective surgery, 33 underwent total arthroplasty (hips and knees. Corin: UK and Peter-Brehm: Germany) for osteoarthritis or RA, five underwent revision arthroplasty (Stryker and Zimmer: USA), 21 underwent instrumentation (Peter-Brehm: Germany) surgery for lumbar spinal canal stenosis, and 69 underwent procedures without blood transfusion. As for complications observed upon admission, 155 patients had osteoporosis, 125 had hypertension or received fibrinolytic therapy, and 91 had diabetes mellitus. Other complications included dementia, heart failure, post-cerebral infarction, cancer and hepatitis.

Regarding preoperative renal function, there were 141 patients (41.7%) with an eGFR < 60 mL/min/1.73m^2, including 29 patients on hemodialysis (8.6%). The distribution of cases with an eGFR < 60 mL/min/1.73m^2 across the three institutions is shown in table 1. Preoperative Hb levels ranged from 6.6 g/dL to 15.8 g/dL (mean: 12.1 g/dL), and 107 patients (31.7%, including 29 on dialysis) had an Hb level of less than 11 g/dL, a criterion for renal anemia, at one point in time. Of the 128 patients who underwent elective surgery, 84 (65.6%) used oral iron prior to surgery, 28 (21.9%) used ESAs (epoetin beta pegol; Chugai and darbepoetin alfa; Kyowa Kirin pharma: Japan) for renal anemia, and 19 received preoperative transfusion of leukocytes reduced (filtration by Sepacell Integra, Asahi Kasei Medical: Japan) autologous blood (14.8%: 12 of them used EPOs for autologous blood donation). Thus, their Hb levels immediately before elective surgery were 10 g/dL or higher, indicating that perioperative anemia could be managed successfully. The amount of intraoperative blood loss in all subjects was 20 - 1890g (mean: 627g). Among patients who underwent elective spinal surgery, intraoperative washed blood salvage (Cell Saver Elite, Hemonetics: USA) was performed in 13, and 110 - 660 mL (mean: 265 mL) of autologous red blood cell concentrate could be reinfused in the operating room. Among those who underwent arthroplasty, unwashed blood salvage (CBC-2, Stryker: USA) was performed

in 38 patients, and 110 - 440 mL (mean: 225 mL) could be reinfused in 34 patients who had successful blood salvage. In the remaining four patients, reinfusion was impossible because the amount of blood salvaged was insufficient (due to after bleeding). Allogenic transfusion was performed in 42 patients with trauma such as femoral fractures but only in two patients undergoing elective surgery who had a more-than-expected amount of bleeding. Two patients with preoperative complications died within one month of surgery, one from myocardial infarction and the other from exacerbation of renal failure, but their families had given their consent. As for postoperative complications, all patients aged 85 years and older experienced delirium. Among post-trauma patients who received allogenic transfusion, pneumonia occurred in six patients, hepatitis in three, and postoperative surgical site infections in three, but no major complications were noted in the 84 patients who underwent elective surgery and could receive preoperative anemia management.

	Total number of beds	Number of cases	Cases with preoperative eGFR < 60 mL/min/1.73m^2	Patients on dialysis
All institutions combined	582	338	141 (41.7%)	29 (8.6%)
Sakai Sakibana Hospital	310	223	90 (40.4%)	20 (9.0%)
Sakibana Hospital	94	95	42 (44.2%)	9 (9.5%)
Sumoto Itsuki Hospital	178	20	9 (45.0%)	0

Table 1: *Proportion of patients aged 70 years and older with reduced renal function before surgery in each institution.*

Discussion

In Japan, blood can be donated by people up to 60 years of age. Due to the declining birthrate and increasing number of elderly people coupled with the impact of the coronavirus pandemic, it is becoming more difficult to secure allogenic blood [4]. Unlike other countries, Japan has an advantage of having national health insurance coverage for autologous blood donation, and concomitant use of iron therapy and EPOs is allowed with appropriate Hb control to prevent blood clots [5]. In our investigation, a decline in preoperative renal function was also noted in patients aged 70 years and older requiring orthopedic surgery (41.7%). Among the three institutions operating under different medical systems, no major difference was found in the percentage of patients with renal dysfunction. The results were also similar to those of an investigation conducted four years ago with regard to reduced renal function in ambulatory patients aged 70 years and older, including those with internal diseases (41.6%). In Japan, patients who persistently have an eGFR < 60 mL/min/1.73m^2 and an Hb level < 11 g/dL are considered to have renal anemia, and it is important to improve renal anemia not only for reducing the incidence of perioperative complications but also for avoiding renal failure (dialysis). The hospitals affiliated with Kindai University 10-year Graduate Association advocate the use of ESAs for renal anemia in elective surgery, in addition to preoperative autologous blood donation [6]. Any surgical procedure should be performed under the best conditions and being pressed for time does not benefit the medical team or the patient and their family. A patient should be given all available options and thus must be informed of disadvantages of undergoing elective surgery in an anemic state. Moreover, in trauma cases, we perform preoperative blood transfusion in patients with fractures, which are associated with a large amount of bleeding, to avoid inducing anemia-related stress before and during surgery. However, even if transfusion of pre-storage leukocytes-reduced allogenic blood could be performed, it cannot be denied that the patient's immune capacity will be reduced by the use of allogenic blood because immunologically, no identical blood exists [7]. Through this investigation, we found that taking measures to improve anemia during the waiting period for surgery (iron therapy combined with EPOs depending on the Hb level and surgical procedure) and performing transfusion with pre-storage leukocytes reduced autologous blood with intraoperative/postoperative blood salvage make it possible to respect the patient's desire to use their own unique immunologically original blood for their surgery, with a low likelihood of postoperative complications.

Conclusion

Among orthopedic surgery patients aged 70 years and older, 41.7% had reduced renal function. Perioperative anemia management can lower the risk of postoperative complications.

Acknowledgements

Special thanks for the director general Dr. Keiji Inoue (Keijin group).

Conflict of interest

No potential conflict to this article was reported.

Bibliography

1. S Mihira., *et al*. "Changes in bone mass in Japanese elderly patients with osteoporosis treated with anti-RANKL antibody following bone formation by PTH". *EC Orthopaedics* 5.1 (2016): 10-13.

2. H Kasuga., *et al*. "Surgical status of patients with orthopedic disease based on the estimated glomerular filtration rate". *EC Orthopaedics* 4.1 (2016): 450-452.

3. H Kawai., *et al*. "A case report for received cement type total knee arthroplasty in osteoarthritis in patients with chronic kidney disease, during of long acting erythropoietin administration (Japanese)". *Jikoketsuyuketsu* 30.1 (2017): 93-97.

4. Homepage from the Japanese Red Cross Society (2020).

5. H Kikuchi., *et al*. "Erythropoietin administration for preoperative autologous blood donation from patients scheduled for orthopedic surgery". *The Journal of Rheumatology* 8.2(1998): 139-145.

6. H Kikuchi., *et al*. "Orthopaedic surgery from patients with anemia for chronic renal disease who treated by continuous erythropoietin (Japanese)". *Jikoketsuyuketsu* 32.1 (2019).

7. DJ Riulzi., *et al*. "A clinical and immunologic study of blood transfusion and postoperative bacterial infection in spinal surgery". *Transfusion* 32 (1992): 517-524.

Volume 11 Issue 10 October 2020