

Original Research Article

Epidemiology of primary knee replacement in St. Carolus Hospital from 2016-2020: a descriptive study

Endrotomo Sumargono^{1,2}, Maria Anastasia², Nadhea Debrinita Surya², Vicky Sagita Hanka²,
Raden Honggo Pranowo Sampurno Secodiningrat², Erica Kholinne^{1,3}

¹Department of Orthopedic Surgery, St. Carolus Hospital, Jakarta, Indonesia

²Faculty of Medicine, Universitas Katolik Indonesia Atma Jaya, Jakarta, Indonesia

³Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia

ABSTRACT

Introduction: The purpose of this study was to describe the characteristics among total knee replacement (TKR) patients in St. Carolus Hospital from year 2016-2020 as the surrogate model for the non-existing National Joint Registry.

Methods: Data were extracted from the TKR registry data of a single institution from 2016-2020. Patient demographic data were collected. Intraoperative characteristics were defined as: (1) Utilization of computer navigation system; (2) Type of implants; (3) Type of tibial component; (4) Implant name. Post-operative characteristics were defined as: (1) Length of hospitalization (days); (2) Complication rate (%); (3) Revision event (%). The complication rate included: (1) Deep vein thrombosis; (2) Prosthetic joint infection; (3) Periprosthetic fracture.

Results: A total of 784 primary TKR procedures were performed in 5 years. The average age of the patients was 68.2 years. The metal back tibial component was used more (64%) compared to all polyethylene tibia, meanwhile cruciate-retaining was the most frequent type of implant (74%). The utilization of computer navigation systems was 67%. The average length of hospitalization was 4.3 days. The complication rate was low (6.2%) and the revision rate was 0.3%.

Conclusion: The complication and revision rate following primary TKR was low at our institution's joint registry. Our data provides the characteristic of TKR in Indonesia as the mini joint registry of the country, thus necessitate collaboration with multiple centres to achieve a comprehensive national joint registry.

Level of Evidence: Descriptive study, level III

Keywords: arthroplasty, knee replacement

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Corresponding author : Maria Anastasia, MD. Email : mrnstasia05@gmail.com

INTRODUCTION

Total Knee Replacement (TKR) ranks among the most successful orthopaedic surgical interventions because of the reliability to provide pain relief and significant improvement of the knee function.¹ Objective measures are important to assess the surgical outcome following TKR as many factors contribute to it. For this reason, it is important to have a detailed perioperative record to support an accurate evaluation of the surgical outcome.^{2,3} Joint registry has been developed to overcome this issue. Multiple countries have developed national joint replacement registries. The first national arthroplasty registry was established by the Swedish Knee Arthroplasty Registry in 1975 and then followed by the Swedish Hip Arthroplasty Registry in 1979.^{4,5} The national joint registry aims to collect the characteristics of patients undergoing joint replacement, provide information regarding the types of prostheses used in either primary joint replacement or revision joint replacement, and evaluate the surgical outcome as well as the joint prostheses.^{5,6} In addition to the previously mentioned, the national joint registry is also able to give confidential data about the surgeries, so that the hospitals and individual surgeons can examine their joint surgery techniques, including the types of prostheses for better outcomes in the future.⁶ By combining huge numbers of data with greater variation of implants, populations and environments, joint registry may improve orthopaedic patient care especially in knee arthroplasty cases.⁴

TKR is performed to more than 150 cases annually in our institution. This volume allows us to initiate the model of joint registry which is expected to surrogate the non-existing National Joint Registry. The purpose of this study was to describe the characteristics among TKR patients in St. Carolus Hospital from year 2016-2020.

METHODOLOGY

The Institutional Review Board was exempted from the current study. Data were extracted from the 4 most recent years of annual reports of TKR registry data from a single surgeon of the current institution. These registries were chosen based on the availability of the procedure. The inclusion criteria are all primary knee replacement. Exclusion criteria includes: (1) revision case, and (2) patient with previous surgery of the affected knee. The identical perioperative protocol stated in this paper are surgical approach (medial parapatellar approach), perioperative

pain medication, DVT prophylaxis, and antibiotic prophylaxis along with surgical site infection control. The implant was chosen based on each patient's need (pre-operative radiological examination and clinical condition) and choice (after given information regarding the type of implants). The decision of the implant use in every patient was not an equal policy due particular needs of each patient. Patient demographic data were collected as follows: (1) Age; (2) Gender; (3) Side; and (4) Comorbidities. Intraoperative characteristics were defined as: (1) Utilization of computer navigation system; (2) Type of implants; (3) Implant materials (4) Type of tibial component; (5) Implant name. Post-operative characteristics were defined as: (1) Length of hospitalization (days); (2) Complication rate (%); (3) Revision event (%). The complication rate included: (1) Deep vein thrombosis; (2) Prosthetic joint infection; (3) Periprosthetic fracture. The complication rate was followed up to 2 years follow-up. The patient who did not meet the 2 years follow-up were not included in the study. The revision burden was defined as the number of revision surgeries performed as a percentage of the total number of arthroplasty procedures performed during a given period. For all of the aforementioned topics, the percentages for categorical data were recorded or calculated, and trends were reported when possible. Data were collected from medical record by 4 medical doctors posted in orthopaedic service whom did not involve in the surgery (MA, NS, VH, RS). Descriptive statistics were utilized to report the characteristics of this registry.

RESULTS

A total of 784 primary TKR procedures were performed from January 2016 to December 2020 on an average of 157.8 procedures annually. The average age of patients undergoing primary TKR was 68.2 years (Range, 42 – 87 years). Before pandemic, majority of the patient's age was in the sixth decades (85%) and after pandemic more than half of the population were above the 7th decades. The gender distribution among patients was dominated by females (82%, 642/789). The majority of the patients were with comorbidities (59.9%), with hypertension being the most common presented comorbidity (50.5%). Other comorbidities were diabetes mellitus (14.5%), coronary artery disease (6.7%), congestive heart disease (3.4%), renal disease (1.5%), chronic obstructive pulmonary disease (1.4%), and cerebrovascular disease (1%). The side distribution of TKR procedures was similarly found (42% for left knees and 50% for right knees; 8%

were bilateral TKR procedure). For intraoperative findings, the number of cruciate-retaining implant (74%) used was higher compared to those cruciate-substituting implant (26%), as shown in figure 1.

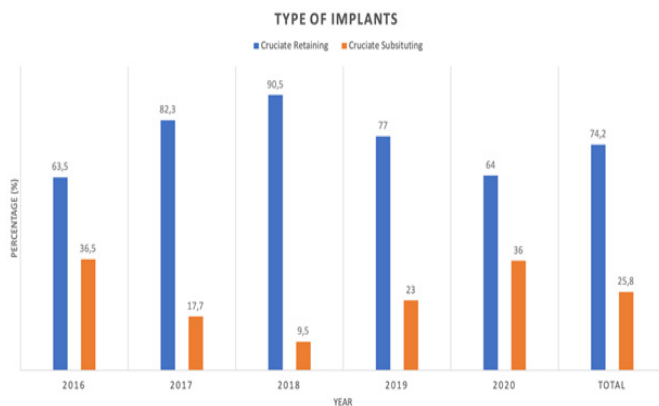


Figure 1. Type of Implant

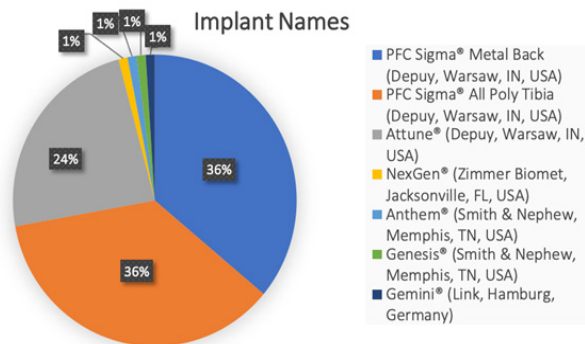


Figure 2. Distribution of implant names

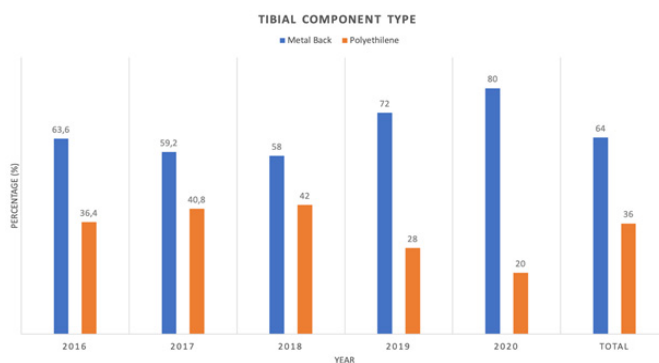


Figure 3. Distribution of tibial component type

The highly cross-linked all polyethylene tibia component were used in 36% while metal-back bearing were used in 64%. All patients received patello-plasty instead of patellar replacement. Among all, 524 procedures (67%) were performed with computer-assisted navigation (BrainLAB® VectorVision® Knee 2.5 Navigation System, Brainlab, Munich, Germany). As for the post-operative patients' characteristics, the average hospitalization

days were 4.6 days (median, 4 days). The complication rate was observed at 6.2%, with deep vein thrombosis (DVT) being the most frequent complication. The DVT incidence was diagnosed in 61 patients (7.7%), meanwhile, prosthetic joint infection (PJI) was found in 6 patients (0.75%). Three of 789 patients underwent revision (0.3%).

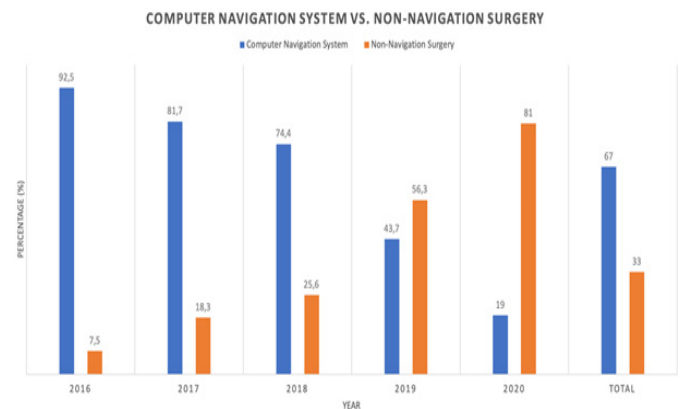


Figure 4. Computer Navigation System Vs. Non-navigation Surgery

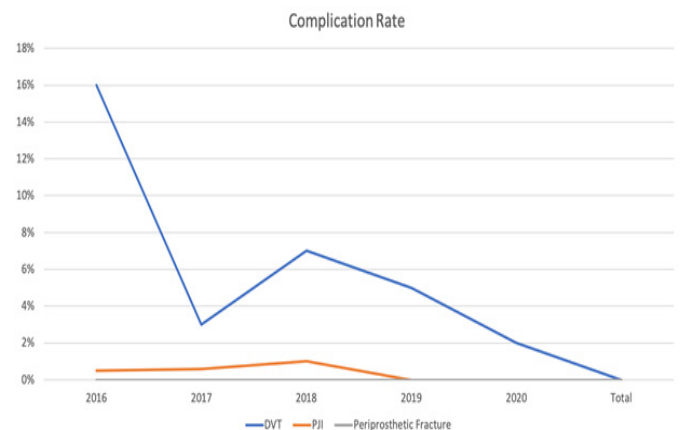


Figure 5. Trends of Complication Rate from 2016-2020

Revision Surgery

Revision surgery was performed only for PJI cases. The total of PJI that occurred throughout the past 4 years was 6 out of 784 procedures and the microbiological examination showed *Staphylococcus aureus* infection in all patients. Three patients who underwent revision are described as follows: (1) The first patient (female, 58 years old, with no comorbidity) underwent debridement with tibial insert replacement 7 months after the index surgery. (2) The second patient (male, 69 years old, no comorbidity), underwent stages of surgery include debridement, implant removal, and reimplantation 1 year after the index surgery. (3) The third patient (male, 63 years

old, diabetes mellitus), underwent debridement with tibial insert a year after the primary TKR.

DISCUSSION

The current study described the data collected from the annual reports of arthroplasty registry data from a single surgeon at a single institution to highlight the trends of the procedure performed. Annually, the number of primary TKR at this institution from a single surgeon were more than 150 cases, with the peak in the year 2018. There is a decreasing trend in 2020 (75 cases that year), particularly because of the COVID-19 pandemic which started in March 2nd 2020 in Indonesia.⁷ Over the past 4 years, it has been shown that the prevalence was higher among women than men and increased with age. The data reported in our study showed similar demographic characteristics to other published studies. Lin *et al.*⁸ described that the incidence rates of TKR in women is much higher than men (71.7–75 % vs 25–28.3 %), and the number of TKR increases significantly among older adults, reaching a peak in the 7th decade age group.

DVT remains the most common complication. The number of DVT event was reduced after 2016 considering the change in postoperative protocol in the institution that constitute mechanical DVT prophylaxis which is Intermittent Pneumatic Compression Device (IPCD) (Flowtron® Excel, Arjohuntleigh, Bedfordshire, UK) apart from pharmacological prophylaxis (Aspirin 80 mg, Rivaroxaban 30 mg or Edoxaban 10 mg for 7 consecutive days post-surgery). The incidence for PJI was relatively small, which is 0.5%, compared to another study from a single institution in India which reported 0.89% for a 36 months cumulative incidence.⁹ The total of PJI that occurred throughout the past 4 years was 4 out of 789 procedures and the microbiological examination showed *Staphylococcus aureus* infection in all 4 patients, demonstrating the importance of prevention of surgical site infection before surgery. A single-centre study in Taiwan also similarly reported that *Staphylococcus aureus* was the most common pathogen found in PJI of TKR.¹⁰ Regarding the precaution for PJI, Parvizi *et al.*¹¹ stated that surgical site decontamination is mandatory to be performed. The most common source of contamination is the patient's skin and soft tissue because the most common cause of surgical site infection is the native microorganisms of the skin.¹¹ For this reason, we routinely perform pre-surgical skin preparation with 2% chlorhexidine gluconate cleansing and surgical skin preparation

using alcohol-based solution and povidone-iodine along with prophylactic antibiotics which are also described in the literatures.^{12,13} Two gram cefazoline was our routine prophylactic antibiotics which were given 1 hour before the incision and continued up to 24 hours dose following the guideline from the American Academy of Orthopaedic Surgeon.¹⁴ Cefuroxime will be given in the case where a patient was identified to be allergic to cefazoline. The number of PJI incidence successfully proved the necessity to use antibiotics prophylaxis to prevent surgical site infection. Although PJI is a rare case in this institution, it is such a devastating complication and a common indication for revision surgery. All three patients who underwent revision surgery were diagnosed with PJI.

As stated in the current literature, mechanical DVT prophylaxis may increase the effectiveness of the anticoagulants used in preventing DVT after TKR.^{15,16} Thus, the use of IPCD has been shown to lower the DVT incidence as shown in figure 6.

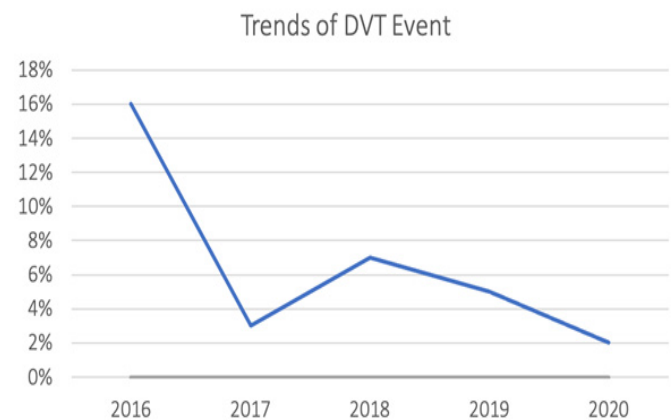


Figure 6. Trends of DVT Event from 2016-2020

The increasing number of TKR procedures performed annually in the country leads to a need to initiate national joint registry as to improve patient care in arthroplasty surgery. To accomplish the goal, the surgeons need to refine the post-operative care, such as pain control and functional outcome. Joint registries were designed to collect data for observing implant survival and failure, defined by revision rates.⁸ National registries attempt to enroll 100% of patients underwent joint replacement from all institutions to assure the big picture of the arthroplasty data in the country. Despite this objective, the current challenge in initiating a national joint registry lies in the patient compliance to the postoperative visitation. For this reason, perhaps telemedicine may be proposed as the solution to this issue. There are some strengths

and limitations of this study. The strengths of this study are the large volume of data used. Second, in the future, we wish that this study can initiate a multicenter study about joint registry that can be used as baseline data for the Indonesian population for TKR research in order to represent the non-existing national joint registry in Indonesia. Lastly, the data provided by our institution can be used as baseline data for the Indonesian population for TKR research. Despite the strength, the study also has its limitation for its retrospective design and data resulted from a single surgeon series which may limit the generalizability of the results reported.

CONCLUSION

From our institution joint registry, we found that patients' demographic and the trend of TKR implant type from 2016-2020 did not change much. The complication rate following primary TKR was low (6.2 %), with DVT still being the most common reported event. The revision rate is 0.3 % and PJI was the only cause of revision. Hence, this shows that prophylactic management has to be considered in order to avoid further complications. Our data provides the characteristic of TKR in Indonesia as a mini joint registry of the country, thus necessitate collaboration with multiple centres to achieve a comprehensive national joint registry.

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