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Original Scientific Paper

A TEN-YEAR FOLLOW-UP AFTER CEMENTLESS TOTAL KNEE ARTHROPLASTY IN COUNTY GENERAL HOSPITAL

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SUMMARY – The aim of this long-term retrospective study was to evaluate the outcome of 109 cementless total knee arthroplasties performed in 101 patients at the General Hospital Bjelovar from January 2010 to October 2012. The survivorship of endoprosthesis and the clinical outcome were analyzed at the 10-year follow-up. The Oxford Knee Score was completed by 47% of patients with an average result of 31,2±9,4. There were two cases of aseptic loosening and one case of periprosthetic infection. Six patients suffered a periprosthetic fracture and were treated with osteosynthesis.

Keywords: *knee arthroplasty, total knee replacement, cement, cementless*

Introduction

The aim of this study was to evaluate the survivorship and functional outcome following cementless total knee arthroplasty in patients that were treated in County General Hospital Bjelovar in a nearly three-year period, from January 2010 to October 2012.

Cemented total knee arthroplasty (TKA) isa the standard operating procedure for end-stage knee osteoarthritis. While cementless total hip arthroplasty has become state-of-the-art for hip replacement surgery, cementless endoprosthesis has not gained that kind of status in total knee arthroplasty. Cemented fixation has been the most widely used method for total knee endoprostheses[1-5]. The beginning of TKA in our hospital was in 1995. In the first decade of TKA, only cemented fixation was used. The first cementless TKA in our Hospital in Bjelovar was performed in 2005. In the following decade, cemented, cementless, and hybrid procedures were performed with the tibial component being cementless and the femoral being cemented. Since 2015 we have stopped using hybrid fixation, and more than 90% of TKAs are cementless, leading to about 50 cementless TKAs performed each year in our Hospital. Initial results of cementless TKA in the 1980s and 1990s were defeating with a quite high revision rate[6,7]. Later results were still in favor of cemented TKA showing better survivorship[4,5,8], but there was no difference in patient satisfaction and functional outcomes between cemented and cementless TKAs[9]. With the development and improvement of prosthetic material and design, there are many recent studies showing better outcomes for cementless TKA[10-16]. With an increasing number of younger patients undergoing TKA and a growing demand for higher physical activity, the interest for cementless fixation is notable[15,16]. Cementless TKA enables biological fixation and provides preservation of bone stock. Once osteointegration has occurred, it is highly

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unlikely that loosening will occur except due to lysis or sepsis. This includes the potential to preserve bone stock and avoid cement debris[3,17]. Cementless TKAs demonstrate a significant reduction in tourniquet time, shorter length of stay in the hospital, and higher odds of being discharged home[1,17].

Methods

This is a single-center retrospective study that included patients who underwent cementless TKA surgery in the period between January 2010 and October 2012. The implant used in all treated patients was Multigen Plus CR (Lima Corporate, Udine, Italy). The outcomes included survivorship of tibial and femoral components assessed by the rate of aseptic loosening, and patient functional and satisfaction outcomes. Medical records were searched for all total knee arthroplasties, both primary and revision surgeries, postoperative follow up radiographic, and physical examination. Oxford Knee Score was used to assess functional outcomes[18,19].

Results

In our Hospital, in the period between January 2010 and October 2012, a total of 114 patients had TKA, with 124 primary total knee arthroplasty surgeries performed. The average patient age at the time of the first TKA was 66±8 years. There were 84 female patients and 30 male patients. 109 total knee arthroplasties were cementless (88%), 10 arthroplasties (8%) were performed as hybrid surgeries with only the femoral component being cemented, and 5 TKAs were cemented endoprosthesis (4%). In further analysis, we included only patients with cementless TKA (n=101). In the group of patients with cementless endoprosthesis, there were 74 female patients and 27 male patients, the average age of patients at the time of the first TKA was 65±8 years. In this group of 101 patients who underwent cementless TKA procedures, eight patients underwent two separate surgeries as TKA was performed bilaterally in this time period. Twenty-two patients had already had TKA on one of their knees prior to January 2010, and 16 patients underwent TKA on the other knee in the period after October 2012.

In the period from January 2010 to October 2022, there were two revision knee arthroplasties performed after 109 cementless primary TKAs. There was only one revision TKA due to aseptic loosening of the femoral component (female patient), and one revision TKA was performed successfully in one male patient as a two-step procedure because of periprosthetic infection. One female patient had evident aseptic loosening with failure of endoprosthetic material. Radiographs at 12 years after primary TKA show signs of aseptic loosening of the tibial component with evident fracture of tibial tray (Figure 1). So far the patient has not undergone revision surgery.

Analysis of x-ray images revealed transparent lines at the prosthesis-bone interface in two patients, but these patients had a satisfactory range of motion (minimal 0-90°) and no complaints (Figure 2).

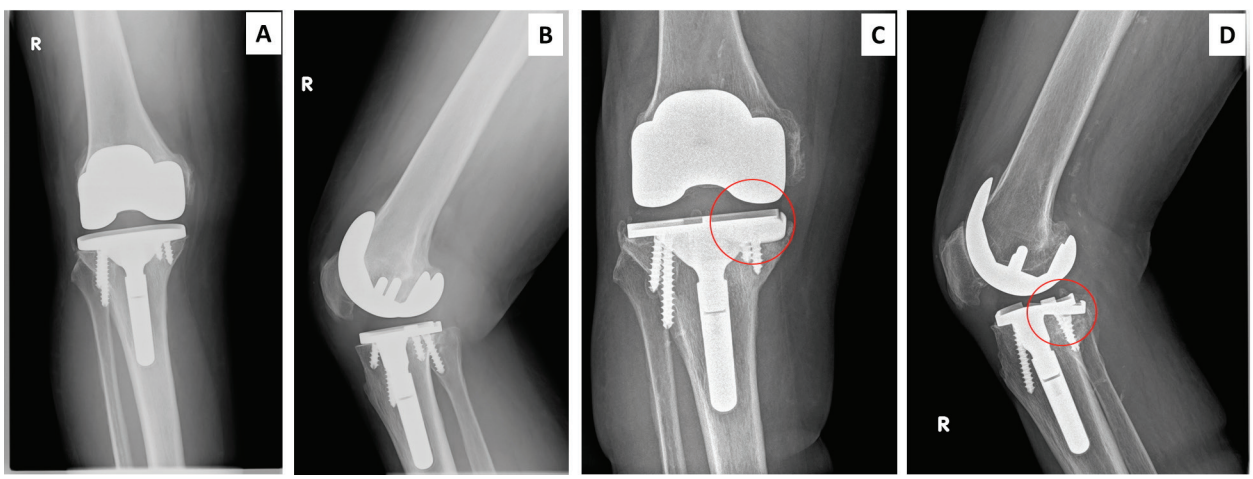

Figure 1. Aseptic loosening and implant failure in a patient with TKA. A, B -postoperative X-ray in 2010; B,C – follow-up X-ray in 2022, evident osteolysis around femoral and tibial component with fracture of the tibial tray (encircled in red).

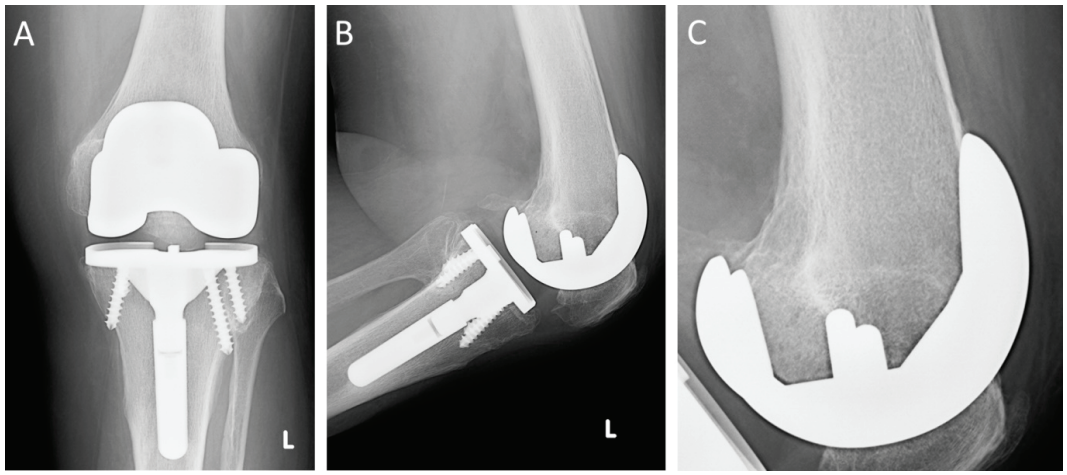

Figure 2. Translucency adjacent to the femoral component in an asymptomatic patient on an 8-year postoperative x-ray. A- anteroposterior image of the left knee; B- laterolateral image of the left knee; C- enlarged femoral part from image B with obvious translucency.

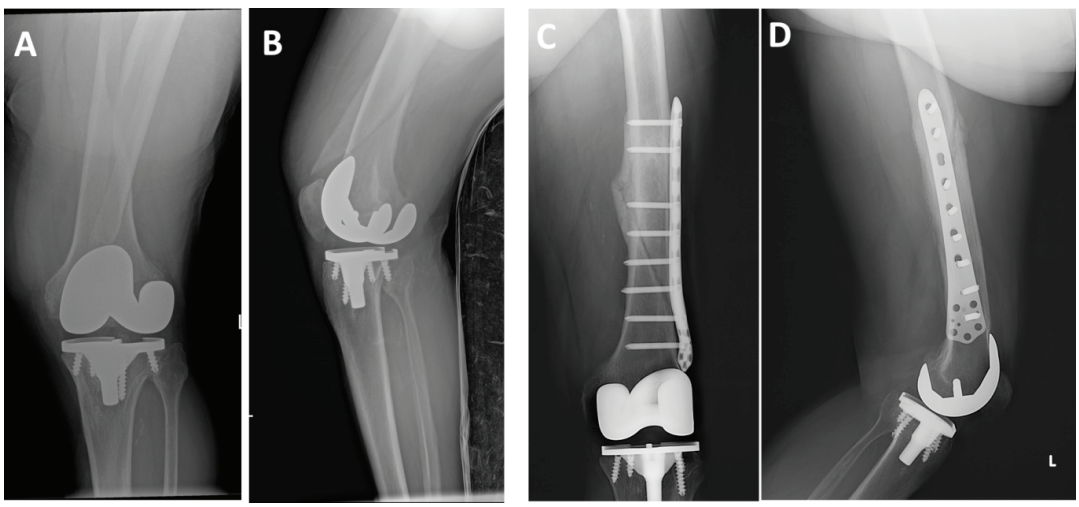

Figure 3. Radiographic images of a patient who suffered a periprosthetic fracture of the left femur 4 years after cementless TKA. A, B – Anteroposterior and laterolateral image of fractured femur; C,D – Postoperative anteroposterior and laterolateral images of left femur 8 months after osteosynthesis.

Six patients suffered periprosthetic fractures. They all involved the femur only and were treated with open reduction and internal fixation (ORIF) (Figure 3).

In the follow-up period, 47 patients participated in the Oxford Knee Score survey 10 years after the TKA. Four of these patients had primary TKA done bilaterally and completed the Oxford Knee Score for each knee which means OKS was done for 51 cementless TKAs. 30 patients died from morbidities unassociated with TKA, and four patients had cerebrovascular insult, and were aphasic or hemiplegic. Twenty patients didn't come for the following check-up and couldn't be reached. The average Oxford Knee Score at the 10-year follow-up was 31,2 ± 9,4 SD (standard deviation), with a minimum score of 12, and a maximum score of 47 (Figure 4).

Discussion

In our patients, the average Oxford Knee Score was 31,2 ± 9,4 SD 10 years following TKA. Half of the patients had a score of above 30 which is considered a satisfactory symptom state according to a study

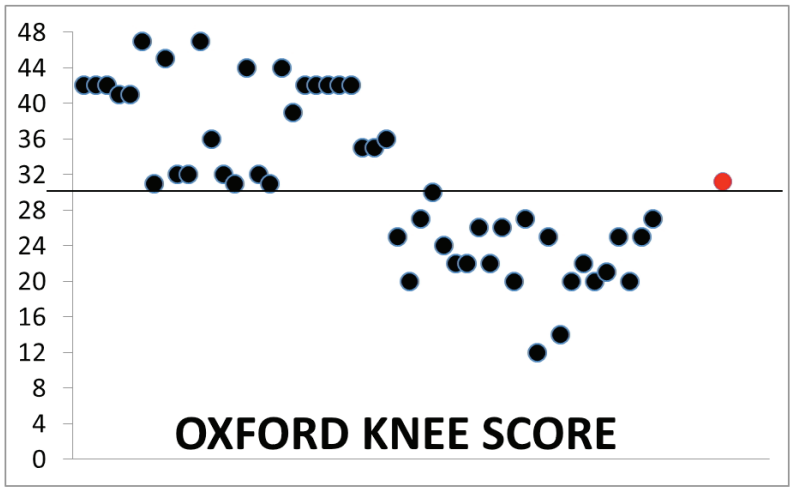

Figure 4. Graph illustrating Oxford Knee Score for all surveyed patients. Each black dot represents one patient. The average score of 31,2 ± 9,4SD is shown as a red dot. The horizontal line set at a value of 30 represents the threshold for satisfactory OKS.

conducted by Ingelsrud et al[18]. According to a study performed by Clemet et al., a threshold of 27 was set for satisfied patients[19]. Fifteen out of twenty-five satisfied patients had TKA on both of their knees and only one had OA diagnosed on the other knee. Their range of motion was at least 0-90° and only one of them had a flexion of 85°. Two of them had polyarthralgia, one had lumboischialgia. Among patients whose OKS was ≤30 which is considered unsatisfactory, nine patients had polyarthralgia, and 7 of them had lumbosacral syndrome with positive Lasegue sign. Two patients had advanced OA of the other knee and were waiting for the TKA surgery and three patients had advanced OA of the hip. Thirteen patients with unsatisfactory OKS had TKA done bilaterally. Considering the fact that many patients with lower OKS had significant musculoskeletal comorbidities, we couldn't conclude that their lower OKS was only due to knee problems. The most difficult activity for patients was kneeling.

In this study, we didn't include cemented endoprosthesis due to the fact that only 15 such TKAs (5 cemented, 10 hybrid) were performed in the observed period (compared to 109 non-cemented). From 2000 until 2005, all of the TKAs we performed were cemented. In 2005 we started using cementless fixation for TKAs with only two such surgeries performed in 2005. From 2005 onwards, the number of cementless TKA performed each year was constantly increasing. In the period between 2005 and 2015, hybrid fixation was also performed with cement fixation used for the femoral component only, the tibial component was cementless. In recent years, we have mostly been using cementless fixation. We have slowly replaced cemented with cementless TKA. With more than 90% of total TKAs being cementless, hybrid fixation is no longer used. We use cement fixation mostly in older patients with significant osteoporosis. Cementless TKA significantly reduces operating theater time and surgery duration[1,17]. The average age of our treated patients was 65±8 years. 60% of patients who received cementless TKA were ≤ 65 years of age. Many of them are physically active patients who regularly undertake labor-intensive work. It has been reported that cemented TKA is associated with higher failure rates in younger and more active patients, due to the lack of remodeling capacity of bone cement [20,21].

The radiolucency that we observed on radiograms of a couple of patients, even though they have been asymptomatic, dictates more regular check-ups. Literature research revealed that some of the initial translucency may resolve in one year[22] or two years[23]. From our own experience, if translucency is not continuous at the bone-prosthesis interface, it is not significant and patients are asymptomatic. There is cause for worry when there is a restriction in the range of motion of the knee, tenderness or pain. Recent magnetic resonance imaging (MRI) studies show improved fixation in cementless compared to cemented TKA at the average 16-month follow-up[24].

However, when we analyzed all of the revision surgeries performed in the 10-year follow-up, in our case a series of 109 cementless TKAs, there were 8 revision surgeries in total; one case of aseptic loosening, one case of periprosthetic infection (0,92%), and 6 cases of periprosthetic fractures (5,5%). One patient is waiting for revision surgery due to aseptic tibial loosening and failure of the tibial plateau of the endoprosthesis, hence we had 9 complications in total which gave us an 8,3% complication rate after the ten-year follow-up which is comparable to the data from the literature[25,26]. One revision was early (periprosthetic infection), and 7 were late revisions[25]. Most studies report periprosthetic joint infection and instability as leading causes for revision surgery[25,26].

The patient who had suffered periprosthetic infection within 6 months of primary TKA had successful revision surgery, and two years later he had TKA surgery on the other knee with no further complications. Unfortunately, he died 10 years after the first TKA from COVID-19 disease. Comparing our numbers to data from the literature, there is no difference in the number of periprosthetic infections between cementless and cemented TKAs[27,28].

We had two cases of aseptic loosening which is comparable to the reported data[29]. The one patient who had aseptic loosening of the femoral component had revision surgery nine years after the primary TKA. In the three-year follow-up after revision TKA, she didn't have any complications. Our results support the latest studies showing the advantages of cementless TKA[10,21,29].

Periprosthetic femoral fractures were all caused by low-velocity falls. The time from TKA to the fracture was 6,3 years (the average range being 3-9 years). They were all Roraback and Lewis type II, successfully treated with osteosynthesis[30,31,32]. Patients' follow-up radiographic images showed formation of bony callus and fracture healing, the patients were all mobile. The reported incidence of periprosthetic TKA fractures varies between 0,3% and 5,5%[31,32]. The reported average time from TKA to fracture varies from 3,6 years to 9,5 years in the literature, but this is mostly for cemented TKA[33,34]. The risk factors that could predispose these fractures include osteoporosis, anterior femoral notching, rheumatoid arthritis, steroid therapy neurological diseases, previous revision arthroplasty, and local osteolysis and infection[31]. In our group of patients, only one of six patients had osteoporosis, the others had no such predisposing factors. Our patients suffered fractures above a well-fixed total knee arthroplasty and were successfully treated with ORIF.

The main limitation of our study was the number of patients who presented for follow up measurement of the Oxford Knee Score, twenty patients (19.8 %) didn't come for the check-up and couldn't be reached.

Conclusion

The results of our single-center long term study reveal very good performance of a cementless Multigen Plus CR (Lima Corporate, Udine, Italy) total knee implant, with rare component loosening and very low overall revision rate, only temporarily present radiolucent lines in a minority of patients, and good to very good clinical results. Therefore, cementless arthroplasty of the knee joint is an appropriate treatment option for patients with osteoarthritis of the knee, especially with an increasing number of younger patients undergoing total knee arthroplasty.

Acknowledgments

All authors declare that they have no conflicts of interest.

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Sažetak

DESETOGODIŠNJE PRAĆENJE NAKON UGRADNJE TOTALNE BESCEMENTNE ENDOPROTEZE KOLJENA U OPĆOJ ŽUPANIJSKOJ BOLNICI

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U istraživanje provedeno sredinom 2022. godine uključeni su bolesnici u kojih su od siječnja 2010. godine do listopada 2012. godine na Odjelu ortopedije i traumatologije s fizikalnom medicinom u Općoj bolnici Bjelovar ugrađene bescementne totalne endoproteze koljena. Cilj je bio ocijeniti desetogodišnje preživljenje bescemetnih endoproteza koljena. Pregledana je medicinska dokumentacija operiranih pacijenata, radiološke slike te je zadovoljstvo pacijenata ocijenjeno ispunjavanjem upitnika za koljeno, "Oxford Knee Score". 47% operiranih pacijenata ispunilo je upitnik s prosječnom ocjenom 31,2±9,4. Dva bolesnika od ukupno 101 (109 ugrađenih bescementnih proteza koljena) imali su komplikaciju u vidu aseptičkog labavljenja femoralne komponente, a jednom pacijentu je zbog periprostetičke infekecije učinjen revizijski zahvat. Šest pacijenata zadobilo je periprostetički prijelom što je riješeno osteosintezom s pločom.

Ključne riječi: *endoproteza koljena, bescementna endoproteza koljena, cement, bescementno*