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Der Pharmacia Lettre, 2017, 9 [2]:153-165
[http://scholarsresearchlibrary.com/archive.html]

Der Pharmacia Lettre
Scholars Research Library
ISSN 0975-5071
USA CODEN: DPLEB4

Current Trends in Knee Arthroplasty

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ABSTRACT

Total knee arthroplasty [TKA] is a commonly performed surgical procedure designed to alleviate knee pain and improve function in individuals with knee osteoarthritis the purpose of collecting the latest information and updating the reports is to summarize the published articles and inform the colleagues. In so doing, the articles published in American journals of arthroplasty and joint surgery and the proceedings of the conferences that were mostly held in 2004 have been utilized so that delicate and precise spotlights retrieved from scholars' breakthroughs can be applied in daily medical practices. It should be noted that this surgery is as much effective as cardiovascular bypass surgery in enhancing the quality of the patients' lives. Pain is one of the major problem for patients underwent Total Knee Arthroplasty [TKA]; appropriate pain management is a key factor that can result early to move, physiotherapy, and most importantly, patient satisfaction. Results of recent meta-analyses demonstrated that using COAS for TKA significantly reduced the relative risk of excessive implant misalignment by 25% compared TKA. Infection after total knee replacement [IATJ] is a rare complication. Gentamicin, tobramycin and vancomycin are good alternatives as thermoresistant agents.

KEYWORDS: *knee arthroplasty, osteoarthritis*

TREATING KNEE OSTEOARTHRITIS WITHOUT ARTHROPLASTY

Total knee arthroplasty [TKA] is a commonly performed surgical procedure designed to alleviate knee pain and improve function in individuals with knee osteoarthritis. Despite the high incidence of knee replacement and the availability of postoperative rehabilitative approaches, functional problems following total knee arthroplasty may be incapacitating because of persistent pain, instability and a limited range of motion [1]. While total knee replacement can effectively alleviate the pain, and enhance the knee function, there are some other approaches that can be utilized as the initial treatment. Anti-inflammatory drugs are associated with cardiovascular side effects; therefore, they should

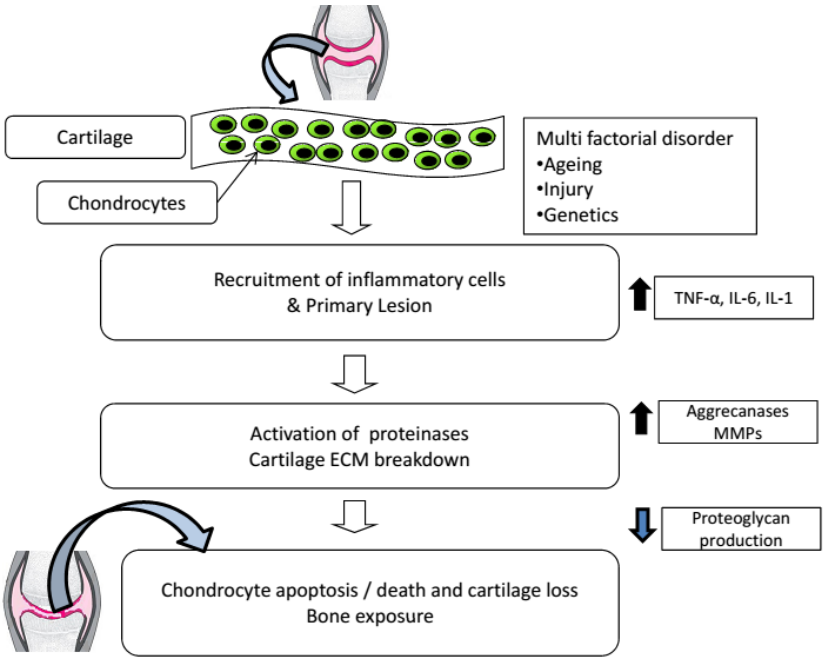
be utilized with much care in diseases with cardiovascular and neurovascular risk factors. The American Academy of Orthopedic Surgeons has issued a statement that physicians can prescribe traditional therapies if gastrointestinal tract is sufficiently protected.

Two studies have investigated the role of intra-articular injection in the treatment of knee arthritis. In a prospective study, three methods of super medial, superolateral, and lateral joint line injections with low-volume drugs [2-3 ml] were assessed. The results indicated that the lateral joint line injection had failed in 50% of the cases. In another study that was a meta-analysis, injection of hyaluronic acid was compared with placebo, the results of which indicated alleviation of pain, function improvement, and few side effects. In general, patients who were over 65 and those who had advanced osteoarthritis radiography benefited less from the treatment.

Implementing autologous chondrocyte in patellofemoral articulation was evaluated in 45 patients. After following up for two years, the treatment failed in 8% and succeeded in 87% of the patients.

The effect of osteotomy was investigated in two prospective studies. In one of them, 61 arthritis knees with medial opening-wedge proximal tibial osteotomy were studied, in which the patients' satisfaction mean score was 7.6 [1 the worst and 10 the best]. In the other study, 21 hemicallotasis bilateral opening-wedge osteotomy knees were studied and ultrasound accelerated callus maturation.

Figure 1: Pathogenesis of osteoarthritis [2].



PAIN CONTROL [MANAGING THE PAIN DURING THE SURGERY]

Pain is one of the major problem for patients underwent Total Knee Arthroplasty [TKA]; appropriate pain management is a key factor that can result early to move, physiotherapy, and most importantly, patient satisfaction. As there has been a strong recent tendency toward less invasive techniques and accelerated rehabilitation, there has been an increase in reports on the number of cases in which the pain was controlled during the surgery. Ranawat and Ranawat have introduced a protocol based on which before the surgery, Vioxx, Refecoxib, and Oxycodone, morphine to anesthetize the spine, knee intra-injection, and Vioxx and acetaminophen were prescribed and applied. After a follow-up period of 6 months, it was concluded that the rate of manipulation decreased and recovery speed and motion range increased compared to in the patients who had used this protocol compared to those who had utilized narcotic medicines. Moreover, injecting 0.5 cc of bupivacaine to femoral nerve caused a reduction in morphine consumption and the patient felt less pain. Local injection of bupivacaine, morphine, and epinephrine decreases bleeding rate, controls the pain, and reduces narcotic consumption. After consumption of joint capsule, injection of 20 ml bupivacaine 5% reduces the pain and the patients will be discharged from recovery 23 minutes earlier. Investigations have indicated that tens also have no effect in decreasing the pain. [3], in one study compared the analgesic effect of single injection femoral nerve block [SFNB] with local infiltration analgesia [Lia]. forty patients who underwent TKA under spinal anesthesia were randomized to receive single femoral nerve block [group F] or intra-periarticular infiltration [group I]. Group F received single injection 20cc ropivacaine [10 mg/cc] and in group I, a combination of 300 mg ropivacaine, 30mg ketorolac and 0.5mg epinephrine diluted to a volume of 150cc and locally injected in and around the knee joint in 3 stages. Postoperative pain intensity measured by Visual Analog Scale [VAS]. Group I had significantly lower morphine consumption in the first postoperative day [10 vs. 12.5 mg. Within 6 hours postoperatively, VAS score was statistically lower in group I compared to group F [3 vs. 4,]. However, within 12 hours it was statistically higher in group I than group F [6 vs. 5,]. Other parameters were not statistically different in two groups

MANAGING BLOOD DURING THE SURGERY

Different methods to minimize blood injection have been investigated. A survey conducted among 433 active knee and hip surgeons indicated that 60% autologous blood, 53% epoetin alfa, and only 11% antifibrinolytics are routinely utilized to compensate for the blood loss. In a retrospective study, 1402 total knee arthroplasties were investigated. The result of this study indicated that the best predictive factors in the need for autogenous blood transfusion in old ages were low hemoglobin level and low-molecular-weight heparin. The effect of epoetin alfa was compared with that of preoperative blood donation. Preoperative blood donation and consumption of epoetin alfa reduces the need for blood transfusion to 11%. Nowadays, OrthoPAT device [Haemonetics, Braintree, Massachusetts] which is an automatic system for collecting blood cells during and after the surgery can reduce the need for blood transfusion to 5% in unilateral total knee arthroplasty, 9% in bilateral total knee arthroplasty, and 4.8% in total hip arthroplasty.

In another report in which epoetin alfa was selectively utilized without preoperative blood donation, the proportion of postoperative blood injection decreased to 2.8% for hip articulation and 1.4% for knee.

UNICOMPARTMENTAL KNEE REPLACEMENT

According to clinical results, noninvasive techniques are becoming more acceptable every day. UniSpacer arthroplasties have not functioned well. In a review conducted on 37 knees in 34 patients who were treated through this method, after an average follow-up period of 8 months, the results were acceptable in 10 cases, average in 15 cases, and poor in 12 cases. The researcher found that SnuSpacer arthroplasty is not recommended for inner compartment arthritis.

Traditional unicompartmental arthroplasties have led to more acceptable results. Out of 136 patients who had had Marmor unicompartmental arthroplasty and after at least 21-year follow-up, 19 patients had have a second operation after 10.6 years on average and 19 patients after 20 years of follow-up had 75% of disease development symptoms and 20% had wear symptoms on their tibial part. The results of a 10-year follow-up of Miller-Galante unicompartmental arthroplasty in 113 patients indicated that there were 4 revisions and the 5 and 10-year survival rates were respectively 94% and 90%. After 15 years, out of 59 other patients, 10% had patellofemoral symptoms and 26% had radiographic symptoms of osteoarthritis in the same articulation and two patients had their knee totally replaced. Fifty-none other patients who had utilized the mobile plate arthroplasty of Biomet Company were reported to have no dislocations after 10 years of follow-up. However, there were one case of loosening and 4 revisions. No cases of revisions were observed among 113 patients who had undergone hydroxyapatite and fixing after 6.9 years of follow-up. There was only one case of tibial radiolucent. Unicompartmental knee arthroplasty lends can be conducted through less invasive techniques. Fifty-seven patients were operated through small-incision technique and after 2 years, a tibial fracture, a revision for patella dislocation, and two tibial radiolucent cases were observed.

Muller *et al* compared 38 surgeries conducted through an open approach with 30 surgeries that were conducted through a less invasive approach. They concluded that, the latter had resulted in a higher function score. However, Lombardi *et al [4]* reported that out of 79 surgeries, 13 cases had failed after a 34-month follow-up period. They concluded that more favorable results would be attained by excluding tibial fractures and obesity.

Investigating the role of the anterior cruciate ligament in patients without healthy anterior cruciate ligaments indicated that higher posterior slope was associated with a higher rate of the surgery failure. Therefore, the results indicated that the posterior slope should not exceed 7 degrees. A robotic investigation of cadaveric knees indicated that medial unicompartmental arthroplasty would not disturb the anterior stability of the knee. In another study, sagittal kinematics of the unicompartmental knees that had fixed-bearing total knee and the normal knee replacement through dynamic fluoroscopy was investigated and it was concluded that unicompartmental one is also associated with normal sagittal kinematics if there is a healthy anterior cruciate ligament. Polyethylene wear in this surgery was also investigated and the results indicated that if polyethylene is sterilized in air, it is susceptible to wear and fracture. Linear wear of polyethylene was reported to be 0.02 mm per year.

The clinical results of total knee arthroplasty continue to be reported excellent; however, there is an ongoing debate on which fixation technique is better. Cemented total knee replacement was investigated in 72 under-50-year-old patients and the results indicated that the survival rates after 15 and 20 years were respectively 96.7% and 92.2%. In 2004, PFC; Johnson and Johnson, Raynham, Massachusetts studied 156 Press Fit Condylar total knee arthroplasties and reported that the survival rate after 14 and 17 years was 91.5%. The survival rate of 524 Kinemax total knee arthroplasties [Stryker] after 10 years was also 96.1%.

In a prospective randomized study on 20 patients who had bilateral total knee arthroplasty, the posterior cruciate ligament was retained on one side but removed on the other side. There was not a significant difference between the scores of the two knee models; however, better motions were reported in the one with removed posterior cruciate ligament. An investigation on 134 cement less low contact stress [LCS] cases after 7.7 years of follow-up indicated that radiolucent tibial line had not changed in 99% of the cases and there were no cases of revision. A study on 1000 patients with total knee arthroplasty during a follow-up period of 6.6 years indicated 0.5% of revision.

Mobile-bearing total knee replacements were paid much attention last year. Kinematics of different mobile-bearing knees has been investigated. Studying all types [including posterior ligament, removed ones, or post stabilized ones] indicated that polyethylene bearing moved relative to the tibial tray. However, in a fluoroscopic three-dimensional analysis, it was observed that polyethylene bearing motion was small in the type of anterior ligament retaining.

The results of another study indicated that mobile-bearing total knee replacement would not reduce lateral retinacular release, patellar tilt, or subluxation and would not make much difference in motion range.

Early instability in 25 patients was warning evidence. Therefore, while evaluating the long-term benefit of any innovation, any known problems that will result in failure should be taken into consideration. This prosthesis had a survival rate of 93.7% in 110 patients over a period of 5-9 years. In a short-term follow-up of 41 months, 57 patients with this prosthesis were compared to 45 patients with fixed-bearing total knee replacements. The results indicated that there was no difference between them in terms of knee motions and knee score. Radiographic findings also indicated no differences. Therefore, the mobile bearing was replaced due to its motional failure. Following up 82 cementless prostheses during 2 years and comparing them with the traditional knee replacement indicated that the former had 8% of revision due to lack of growth and bone sticking, low knee score, more pain, and tendency to a smaller range of motion. Comparing mobile-bearing prostheses with deep dish ones indicated that in the former rollback does not occur and the range of motion is not improved. Comparing LCS and mobile-bearing LCS also indicated that after a follow-up of 5 years there was no significant difference between them.

LESS INVASIVE TOTAL KNEE REPLACEMENT AND USING COMPUTER-ASSISTED SURGERY

Even though there is little agreement on less invasive total knee replacement and use of computers, there are many reports on the leading role of the computers. For instance, it was observed that most errors in a manual navigator occur during placing the tibial or femoral manual pins or cutting the bones. A study compared 50 knee arthroplasties conducted through less invasive subvastus approaches without patella reversion with a control group and the result

indicated that in the experimental group the duration of the surgery extended ten minutes but bleeding decreased up to 150 cc, pain decreased, early abilities to raise the feet and reach 90° of flexion were achieved.

However, the rate of complications in the "less invasive" group was high and radiography indicated tilting prosthesis. Similar results were reported in a study conducted on 30 total knee replacements. In 100 other patients with 14 cm incision, hemoglobin level and hospitalization duration decreased. However, there was not a significant difference in terms of motion, walking, pain, and imbalance. In a 2-year follow-up of 219 less invasive knee replacements, 98% of good and excellent results were observed, 6 cases required manipulation, and 5 cases needed reoperation. Almost the same results were reported in midvastus approach in which the patellar is reversed.

Despite the abovementioned comments, in a symposium, Hungerford suggested that there is no evidence on the benefit of this approach except for that mini-incision will result in imbalance placement of the prosthesis especially for surgeons who do not perform a lot of operations annually.

The importance of computerized navigator has also been investigated and the results indicated that this method was the best help in regard with coronal alignment and led to real mechanical alignment in all patients; however, no difference was observed regarding tibial slope, patellar rate, and knee score.

Two other researchers also compared computer-assisted and standard operations. In the former, 98% of the femoral components and 100% of the tibial components located within the 3^{o} scope and in the latter these figures were respectively 90% and 92%. In the group that had undergone the computer-assisted surgery, 7.5% of the prostheses were in about 2% of the natural alignment while this figure was 58% in the standard approach.

Hoffart [5], demonstrated that computer-assisted orthopedic surgery [CAOS] provides better clinical outcomes at 5 years than conventional [total knee arthroplasty] TKA. also, recent meta-analyses by [6], and Bauwens and colleagues demonstrated that using COAS for TKA significantly reduced the relative risk of excessive implant misalignment by 25% compared TKA. Furthermore, [7], randomly assigned 80 patients to receive either conventional or navigated TKA and found that patients who underwent navigated TKA were less likely to have mechanical axis malalignment postoperatively and had significantly improved Knee Society scores.

TECHNIQUES IN TOTAL KNEE REPLACEMENT

There are different reports on the rotational alignment of the femoral component. The results of a report indicated that the method of posterior condylar cut parallel to the previous tibial cut was associated with better and more reliable clinical results compared to the method of "parallel epicondylar axis". Using the computers and computerized scans before and after the surgery showed that the mean relation between the posterior condylar axis and the epicondylar axis was 4.69° of internal rotation. However, the mean relation of Whiteside's line with the epicondylar line was 0.07°. Therefore, it was recommended that using posterior condylar axis and the epicondylar axis is not reliable and it is better to utilized Whiteside's line. Knee functional alignment was examined through cadaveric models and the results indicated that if the alignment be 3^{o} instead of 6^{o} of femoral distal cut which is common, the knee will have more

natural flexion and extension. An investigation was also conducted on the need for exterior retinacular release based on femoral rotational function and the results indicated that when epicondylar axis method is utilized as the rotational alignment navigator instead of equal posterior condylar axis, the need for release will significantly drop [*p<0.0001]*. A study was conducted on the two incision methods of tensioned gap and measured resection in 12 cadaveric knees. In the first method, all the knees digressed while rotating toward varus and the patellar groove rotated outwards. However, in the second method, the patellar groove moved in its own direction and varus and vaglus had natural rotation, alignment, and power transfer. The same issue was investigated in another study because the first method resulted in choosing smaller sizes and the author suggested that tight flexion space would lead to worse clinical results.

Several reports have been conducted on soft-tissue balancing. In an investigation conducted on 35 knee replacements with valgus of more than 15^{o}, lateral retinaculum release with a cruciform technique was utilized [10] and stable fixation and extension gaps were attained in all cases. Lombardi introduced an algorithm for the treatment of knees valgus [11] and the distance between peroneal nerve and tibial resection was calculated using MRI imaging to be 1.49 cm.

In a study conducted on 12 knees with severe verus [with a mean of 24^{o}] in which tibial downsizing and resection of the inner side of the tibial bone were utilized, no revisions were reported and the clinical results were acceptable.

Complications that are associated with simultaneous bilateral and unilateral total knee arthroplasties have been investigated in 3 studies. In a report on comparing 514 unilateral arthroplasties with 510 bilateral arthroplasties, it was concluded that bilateral patients had higher rates of severe bleeding, hospitalization duration, heart failure, postoperative confusion, and the need for intensive monitoring. Another report indicated excellent results in 4100 bilateral arthroplasties. And finally, safety of bilateral arthroplasty has not proved in any reports.

VENOUS THROMBOSIS AFTER TOTAL KNEE ARTHROPLASTY

There is still an ongoing debate on the most appropriate approach to prevent thromboembolic disease after total knee arthroplasty. In the seventh conference of college physicians [12], it was suggested that low-molecular-weight heparin – fondaparinux and/or warfarin – should be consumed for 10 days. In a clinical experiment, warfarin was compared with oral ximelagatran and the results indicated that ximelagatran had greater effect than warfarin.

TOTAL KNEE ARTHROPLASTY IN UNUSUAL PATIENTS

Different authors have provided reports on patients with stiff and deformed knees. In 42 knees with valgus deformity of over 10°, arthroplasty was conducted using an inside-out soft-tissue release of the posterolateral capsule and through the pie-crusting of the iliotibial method. After a follow-up period of 5 years, the knee score was 93 and there were 3 revisions.

Another study was carried out on 42 constrained total knee arthroplasties conducted to treat valgus knees with severe deformity and other symptoms. The survival sore was 96% after 10 years. Eighty-two other patients who were cured through cruciate-retaining total knee arthroplasties and had a minimum varus or valgus of 20° were compared to a

control group. There was no significant difference between the two groups in terms of the alignment, knee score, and revision. Fourteen hemophilic patients were reported to achieve obvious improvement, 9 complications were observed among 6 patients, the mean knee score of 32 patients with complete or relative stiffness after 10 years was 86 and the prevalence of the complications was 12.5%.

There are several reports on obese patients. Obese and non-obese patients were compared in a report. Obese patients had an infection level of 6.7%. A similar study was conducted with a follow-up duration of 15 years and the results indicated that the individuals' knee scores were high and revision percentage was low. A 65-month follow-up in the individuals who wanted to receive compensation, indicated that the control group's mean score was high and only five patients out of 21 ones returned to their previous jobs. The result of total knee replacement was acceptable in ten arthritis patients with Ehlers-Danlos syndrome. Sixty patients who had cirrhosis were reported to have lots of bleeding, prolonged hospitalization period, and high rate of mortality. Parvizi conducted a study on cement condylar knee arthroplasties in 166 who had had previous tibial osteotomy [13]. After a 15-year follow-up, the patients' mean knee score and motion had improved.

PATELLOFEMORAL CONSIDERATIONS IN KNEE ARTHROPLASTY

There is still disagreement over patellar knee replacement. In a 10-year longitudinal study was conducted on patients whose patellar had not been replaced, there was 15% reoperation and 3 out of 7 revisions were due to patellar replacement while reoperation is the group whose patellar had been replaced was 5%. In regard with the Knee Society score, WOMAC, a score of SF-12 was gained and there was no significant difference between radiological symptoms and anterior knee pain.

Twenty-eight patients with patellar replacements underwent patellar resurfacing due to severe pain. After a 2.9-year follow-up, lower results were gained compared to the similar group [standard surgery]. Isolated patellofemoral resurfacing was also investigated in an investigation. Argenson *et al* studied 57 patellofemoral arthroplasties. They observed 14 revisions due to tibiofemoral arthritic progression, 11 cases because of femoral loosening, and 4 cases because of stiffness. A survival rate of 58% was observed after a follow-up period of 16 years. In another report with a 3.75-year follow-up, excellent results up to 93% were observed [14].

Figure-2: Infected TKA following resection arthroplasty. Antibiotic-impregnated opaque cement spacer was placed in the tibiofemoral and patellofemoral compartments for treatment of infection [two-stage procedure [8]

COMPLICATIONS OF TOTAL KNEE REPLACEMENT

There are many reports on the complications following total knee replacement. Data retrieved from Medicare Insurance were analyzed and the results indicated that in hospitals where the physicians conduct lots of these surgeries, fewer complications had been observed [13]. In a study conducted on 500 patients, the development of heterotopic ossification was 15% that was more common among men and heavy patients and had caused complications in only 4 patients. In another investigation, periprosthetic supracondylar fractures were treated using retrograde nails and plates. Although both techniques resulted in acceptable outcomes, retrograde nailing was considered as the selected treatment [15].

Treating stiffness is still a difficult problem to solve. In a study, 16 stiff knees that due to the primary arthroplasty had undergone femoral revision of well-fixed components, a satisfaction rate of 73% was reported and the knee score increased from 28 to 65. In 23 other knees that had undergone reoperation because of stiffness, the motion range changed from 60.5 to 82.5. Prevalence of stiffness following total knee arthroplasty was 1.3% [flexion contracture was over 15° and flexion was lower than 75°] whose motion range improved to 93% after reoperation.

In a study, it was concluded that extensor mechanism rapture after knee arthroplasty could be treated by tightly pulling the graft through allografting. Patients who have been treated by utilizing Gore-Tex strips and a gastrocnemius flap also achieved excellent results. In this regard, Rand's investigation entitled, "Extensor Mechanism Complications Following Total Knee Arthroplasty" is worth noticing.

INFECTION IN KNEE REPLACEMENT

Infection is the worst complication following total knee replacement. A study introduced a new approach for diagnosing infection based on neutrophil gene expression. During the infection, the scholars discovered many genes that were meaningfully more than gout corresponding neutrophils. This approach enormously helps physicians with infection diagnosis.

Infection after total knee replacement [IATJ] is a rare complication. It is associated with increased morbidity and mortality increasing the final costs. Gram positive coccus and Staphylococcus coagulase-negative and Staphylococcus aureus are the most common isolated germs [16] reported that the infection rate was 0.51% among 8494 hip and knee arthroplasty procedures.

The primary objective in treating TKA infection is to eradicate the infection. Pain relief and reestablishment of function are secondary objectives, but no less important. Gentamicin, tobramycin, and vancomycin are good alternatives as thermoresistant agents [17].

After a follow-up period of 7.2 years, out of 94 knee arthroplasties that had been re-conducted in two stages due to inflection, 15 cases needed reoperation. In another report, 91% of the operations in the revision phase following primary arthroplasty and 82% following revision were successful and the highest level of success was related to primary inflection and hematogenous inflection. Factors like the patient's gander, age, body mass index, diagnosis, and comorbidity had no effect on success. Two studies were conducted on articulating cement spacers. The results of one of them indicated 92% of success of the two-stage revision and those of the other one showed that there was no difference between this method and the standard one.

POLYETHYLENE WEAR AND OSTEOLYSIS

Wear and osteolysis are among major concerns associated with total knee replacement. A study conducted on 124 tibial inserts with 12 different models and designs during 0-180 months after implementation indicated that the wear in the non-articulating surface [backside] in all models was independent from the mechanism of the surface capture. Therefore, it was claimed that the design of these surfaces should be modified. Complications like burnishing, scratching, pitting, and deformation were observed in 97 other tibial inserts that had been extracted from the body due to inflection, loosening, and instability.

In a study conducted on osteolysis, it was concluded that condylar radiography was better than lateral radiolucency radiography [15]. Using multi-detector scanning in 26 knees indicated that radiography indicates only 20% of radiolucency cases. Investigating the interfering factors like the backside section and sterilization method in 365 knees with retaining cruciate and during a 5-year follow-up indicated that polished baseplates and distance from gamma ray in the air decrease the prevalence of osteolysis from 24% to 2%. In a 7-year follow-up investigation on 193 Insall-Burstein II [IBII], no tibial loosening was observed, 8 tibial osteolytic lesions were recorded, 16% radiolucent lines were reported, and 3 revisions were conducted. In a report on 1217 primary total knee arthroplasties after at least 5 years of follow-up, 8.4% failure was observed and the 13-year survival rate was 82.6%. Five factors of age, gender, polyethylene sheet vender, polyethylene finishing method, and polyethylene shelf age were effective [15].

Figure 3: [A–C] Osteolysis. Osteolytic lesions are identified in [A], medial tibial plateau, [B] medial femoral condyle, and [C] proximal tibia] D] Osteolysis, distal femur. There is a large osteolytic lesion at the distal femur with pathologic fracture posteriorly [8]

REVISION OF TOTAL KNEE REPLACEMENT

As the number of young patients who undergo knee arthroplasty soars, so does the number of revision of total knee replacement. It was reported that 53% of the patients who have had their primary total knee arthroplasty were operated by physicians who conduct less than 25 knee arthroplasties per year and 11% of the hospitals in which such operations have been conducted have less than 50 operations per year. Patients who have undergone knee arthroplasty in hospitals with over 200 surgeries per year had less complications compared to those who had their operation in hospitals with less than 25 surgeries.

The results of an investigation conducted on 5670 surgeries indicated that knee replacement with cement had better results compared to hybrid, cementless, and unicompartmental arthroplasties. The failure mechanism of the non-modular metal-backed cemented tibial component was also studied and the results indicated that 1.3% of them lead to revision. The major failure mechanism was related to preoperative deformities, technical factors, alignment, and ligamentous balance [17].

The failure mode and frequency resulting in revision were also investigated: 17% due to inflection and 83% for other reasons. The most common of them include knee extensor mechanism instability [33%], polyethylene wear [27%], tibial component failure [26%], femoral lysis [24%], tibial lyisis [24%], tibial insert failure [21%], and femoral failure [21%]. In another study, 9475 replaced knees were investigated and the results indicated that there a relation between planovalgus foot and failure of the surgery. The author observed that out of 14 knees that had undergone reoperation because of instability, 12 knees had posterior tibial tendon insufficiency and suggested that progressive flatfoot deformity should be treated so that any potential deleterious effect could be prevented, especially if the patient has a valgus deformity. It should be noted that the prevalence of posterior tibial tendon insufficiency is high [15%].

Resection and arthroplasty approach are major considerations in revision operations. The result of 67 tibial tubercle osteotomies indicated that the bone union was natural; there was no patellofemoral complication; no mal-alignment was observed; and the total rate of complication was 7% [16].

A review was conducted on 270 knee revisions that had been carried out with tenolysis quadriceps mechanism. Low rate of complications was observed and compared to other methods [17]; however, the quadriceps turndown technique

was associated with necrosis patellar complication. Thus, this method is not recommended if alternative methods are available [18].

In an investigation, distal femoral allograft was utilized to treat periprosthetic supracondylar fractures at prosthesis locations where the bone quality was not good [18]. Out of the 12-operated kneed, only 3 knees needed to be re-operated. In 80 arthroplasties where only one component had been replaced, the knee score was 75 compared to 85 retrieved in cases where two components had been replaced. Therefore, authors highly recommend that the failure is due to instability and/or wear or the component needs to be changed, it is better to conduct total knee arthroplasty. In another study, tantalum cementless augments were utilized in the revisions and the short-term results indicated no mechanical failures.

In 39 knees that due to patellar dislocation had undergone revision, patellar tracking was corrected by modifying the alignment; however, two-third of the patients had disabilities and pain. The results of a study indicated that out of the 32 isolated polyethylene revisions, 4 cases needed total revision.

These advantages include better bone stock in the case of revision attributable to conservative bone cuts and a lack of biologic response to polymethylmethacrylate, shorter tourniquet and operating times and a lack of cement extrusion and cement-wear debris [19].

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