IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 18, Issue 6 Ser. 6 (June. 2019), PP 01-04
www.iosrjournals.org

A Brusque Contemplate Of One Stage and Two Stage Revision Surgeries

Uzair Masood, Wei Bo, Umair Masood, Qingqiang Yao, Qiangrong Gu, , Liming Wang*.
Professor of Department of Orthopaedics, Nanjing First Hospital, Nanjing Medical University, Nanjing, China
Corresponding Author: Liming Wang

Abstract: *After the TKA (total knee arthroplasty) and THA (total hip arthroplasty) if the periprosthetic joint infection occurs within the period of 2 years it is related with pain, minimal movement, insecurity, feeling of loneliness and may usher to death. There are many treatment options for re-infection of prosthesis but one-stage or two-stage revision are primarily involved. The two-stage revision surgery is commonly used procedure and it is referred as "Gold Standard". Among the two treatment options the better treatment option is still not clear. After the total hip replacement there is more chances of re-infection following one-stage compared to two-stage revision surgery. Utilizing Sonication for the diagnosis of PJI has proved promising for detecting the Pathogens. It is more accurate than the conventional method as it has lesser specificity more favourable to patients with factors which are patient-related for occurrence of infection are as follows obesity, tobacco abuse, immune suppression, rheumatoid arthritis, diabetes mellitus and history of infection related with a prosthetic joint or history of revision arthroplasty at some time. Although two stage revision process is the present gold standard procedure mostly practiced but it has 0-41% re-infection rate. It is also an expensive technique which includes prosthesis replacement, drug therapy and prolonged inpatient stay. In order to enhance the patient outcomes, the routine use of single stage knee revision surgery has increased in some departments. The probable benefits of this procedure include decreased exposure to surgery, reduced inpatient admission and a faster recovery of functions.*

Key words: *Rheumatoid arthritis, Diabete mellitus, Sonication, total hip replacement, one-stage revision, two-stage revision*

Date of Submission: 25-05-2019 Date of acceptance: 10-06-2019

I. Introduction

After the TKA (total knee arthroplasty) and THA (total hip arthroplasty) if the periprosthetic joint infection occurs within the period of 2 years it is related with pain, minimal movement, insecurity, feeling of loneliness and may usher to death [1,2]. There are many treatment options for re-infection of prosthesis but one-stage or two-stage revision are primarily involved [3]. The two-stage revision surgery is commonly used procedure and it is referred as "Gold Standard" [4]. Among the two treatment options the better treatment option is stil not clear. According to some studies one stage revision surgery was dependable to lesser extent [5]. After the total hip replacement there is more chances of re-infection following one-stage compared to two-stage revision surgery [6]. According to reports the genereal obliteration range of infection was in between 73 to 100 % in one-stage and 82 to 100% in two-stage revision surgeries by jamsen and colleaguein 2009 [7]. Since THA's introduction in 1970's the best treatment option following Total Hip Arthroplasty deep prosthesis infections remain controversial [8]. There are few disadvantages associated with two stage revision surgeries such as functional impairments after re-implantation, mortality and morbidity [9]. Hence in few patients utilization of single stage revision surgery is encouraged . The objective of our review is to compare the two stage and one stage revision surgeries rates of re-infection and other clinical results.

The Clinical Challenge

Since the past decade there has been an increase in number of primary total knee and total hip arthroplasties in year 2006 in the United States with almost 800,000 such performed techniques and the procedures which are performed to a lesser extent in comparison to TKA and THA were replacement surgeries of Ankle, Wrist, Elbow, Shoulder, Temporomandibular, Inter Phalangeal and Metacarpo phalengeal joints [10]. Quality of life is improved by prosthetic joints but it also has a disadvantage of resection or revision arhtroplasty. Infection, aseptic loosening, bone or prosthetic fractures and dislocation are some of the causes of revision arthroplasties [11]. The complication which is most serious and also common is infection and it occurs in the

range of 0.3 to 1.7% of hip arhtroplasties and 0.8 to 1.9% of knee arthroplasties. The risk Accurate Marker Pro Calcitronin and the positive Interleukin 6 and C-Reactive Protein levels provide the obvious resources to a surgeon regarding the infection at the instance of surgery.

Utilizing Sonication for the diagnosis of PJI has proved promising for detecting the Pathogens. It is more accurate than the conventional method as it has lesser specificity more favourable to patients with factors which are patient-related for occurrence of infection are as follows obesity, tobacco abuse, immune suppression, rheumatoid arthritis, diabetes mellitus and history of infection related with a prosthetic joint or history of revision arthroplasty at some time [12]. The other risk factors which are surgical includes allogenic blood transfusion, bilateral arhtoplasty and a long operative time (more than 2.5 hours) and the risk factors which are post operative includes *Staphylococcus aureus* bacteria, prolonged hospital stay, urinary tract infection, mycocordial infarction, atrial fibrillation and complication related to healing process such as (dehissence, wound necrosis, delayed healing, hematoma and superficial infection) [13]. Pain is the most common symptom of periprosthetic joint infection (PJI). Swelling, Erythema, Warmth and Severe pain at the infected joint are the local signs and symptoms in acute infection along with fever. At the site of bone-cemented surface loosening of prosthesis and rarely a sinus tract formation with discharge accompanied with or without pain and sometimes only pain occurs in chronic infections [14].

Prospectus of One stage surgery

One stage revision surgery since the decade of 1970's there are reports of few institutions carrying out one stage revision surgery for prosthetic joint infections after TKA, though most patients are treated with two stage exchange arthroplasty [15]. Although two stage revision process is the present gold standard procedure mostly practiced but it has 0-41% re-infection rate. It is also an expensive technique which includes prosthesis replacement, drug therapy and prolonged inpatient stay [16]. In order to enhance the patient outcomes, the routine use of single stage knee revision surgery has increased in some departments. The probable benefits of this procedure include decreased exposure to surgery, reduced inpatient admission and a faster recovery of functions [17]. After a follow up period of 5 to 15 years the re-infection rate was found to be 19% in a study carried out in Germany at Endo-Klinik which consisted of 104 patients and it is supposed to be the largest study which focused mainly on re-infection [18, 19]. These are reports on rate of re-infection as 2% and 0% by Tiberwal and Haddad respectively in their studies which are supposed to be the latest [20, 21].

One stage revision surgery technique

The surgical process of single stage revision contains of open aggressive debridement along with removing all components and debridement and before administrating the antibiotics many samples are sent to microbiology and then the irrigation of knee is done with Betadine solutions (Videne, Ecolab Ltd, Swindon, Uk) and Hydrogen peroxide and pulsatile lavage [22]. After which the wound is soaked in aqueous Betadine and approximation of wound edges are done. Then the patients redraped, rescrubbing of surgical teamis carried out and new instruments are utilized. Following more lavage implantation of a new prosthesis is done by making use of ALC (antibiotic-loaded cement) accordingly to familiar sensitivities at a volume of <5% of the total weight of cement powder [23]. The patients are subjected to antibiotic therapy postoperatively for minimum of 6 weeks time period suitable to the intraoperative culture up til the nutritional markers like plasma albumin and inflammatory markers (CRP, ESR) concentration return to stable limits, usually in 90% of cases the levels are normalized. After the termination of IV treatment of antibiotics administrations there was no utilization of long-term therapy of oral-suppressive antibiotics .

Prospectus of Two stage revision surgery

The gold standard of periprosthetic infections treatment are believed to be two-stage revision surgery which involves the protocol such as antibiotic-loaded bone-cement spacers implantation [24]. The re-infection rate following two-stage revision surgery continues to be higher although radical debridement with exposition of prosthesis and adjunctive antibiotic administration are the utmost essential support for PJI control [25, 26]. The range of re-infection rates in the literature is from 4% to 50% [27, 28].

Inspite of the options for intramicrobial strategies with two-stage technique, it requires the patients additional hospital stay, submit to supplementary major surgery and observe extensive pain and disability sometimes after revision or during the period between operation who undergo this procedure [29, 30]. The estimated cost of two-stage revision may be 70% higher than the single stage revision and it also has higher disability and morbidity [31, 32]. There are no reports comparing one-stage and two-stage revision surgeries randomized comtrolled trial. In year 2008 there was decision analysis done for comparing one-stage and two-stage revision techniques by Wolf and colleagues in their review literature [6]. According to their reports in pooled analysis there was a higher rate of re-infection following one-stage procedure in comparison to two0stage procedure which was about 12.3% and 6.5% respectively of infected total hip replacements [6].

Although there was a higher rate of mortality in association with two-stage technique when compared to one-stage technique. By utilizing Markov cohort simulation decision analysis, they concluded that comprehensive proportion of risk and benefits advances one-stage technique for treating the infection post total hip replacement [33, 34].

Two-stage revision surgery technique

The first component of the surgery is analogous to one-stage revision surgery intraoperatively. But the implantation of temporary articulating ALC spacers is done next to rescrubbing and redraping [35, 36]. The resistant strains development is reduced by this spacer because it usually consists of 2g Gentamicin and 3g Vancomycin per sachet of Palcos R (Heraeus Medical), thus providing broad spectrum of provision for micro organisms usually concerned with deep periprosthetic infection [37]. Postoperatively, patient is permitted to move limited weight bearing with support and when patient is considered safe discharged to home. For immediate 5 days IV antibiotics was administered to all the patients and afterwards either oral antibiotic therapy or IV was continued for 6 weeks. The patients clinical responselike healing of wound and nutritional and inflammatory markers implicating dissolation of infection is the deciding factor for proceeding with insertion of prosthesis, and it is approved after 2 weeks of time period of cessating the antibiotic therapy which was prescribed to the patient [38]. Then the spacer should be taken out and the cement matle beneath is disintegrated and detached intermittently without compromising bone stock. Then a suitable prosthesis is re-implanted with cemented components and in cases where there is severe bone loss allografts may be used [39, 40]. The types of implants for the single and two stage revision procedure are augments, cones, stems on side or both, semiconstrained implants, hinges, bonegraft etc. According to some studies there was higher mortality perioperatively and infection control was at the rate of 83% with an average follow-up of 4-5 years. The mortality rate is higher in both perioperative stage and also in the follow-up period related to two stage surgery for periprosthetic hip infection [41, 42]. According to some reports in cases of two stage surgical treatment before the follow-up period of 2 years the death rate was 25.8% [43, 44, 45]. Therefore, for analyzing the success of two stage surgery technique the consideration for the cases who had not undergo second stage re-implantation along with good infection control should be done [46, 47, 48]. Prior to second stage surgery if the patient dies infection control is not acquired and it is not a successful treatment for the infection [49, 50].

II. Conclusion

The rate of re-infection following one- or two stage revision surgery was similar according to the documentation from the accumulated published date among the unselected patients. But the functional outcomes are superior with one stage revision surgery technique when compared to two stage revision surgery technique.The documentation justification is comparatively larger for two stage surgery and supplementary effort should be considered as a preference for comparing the two techniques directly.

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Liming Wang. "A Brusque Contemplate Of One Stage and Two Stage Revision Surgeries." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 6, 2019, pp 01-04.