Outcome of total knee arthroplasty following closing wedge high tibial osteotomy: a review of 40 cases

Résultats de la prothèse totale de genou après ostéotomie tibiale de valgisation par fermeture externe: à propos de 40 cas

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RÉSUMÉ

Introduction: Larthroplastie totale de genou après ostéotomie tibiale de valgisation devient de plus en plus indiquée. Cette intervention incite à connaitre quelques astuces et pièges.

Objectif : Evaluer les résultats de la prothèse totale de genou après ostéotomie tibiale de valgisation.

Méthode: Quarante prothèses totales de genou après ostéotomie tibiale de valgisation ont été identifiées. Les caractéristiques démographiques, l'alignement fémoro-tibial et les lisérés périprothétiques ont été documentés en postopératoire. L'évaluation clinique et fonctionnelle a été realisée en pré et post opératoire selon le score IKSS.

Résultats: Le recul moyen était de 11,5 ans. Le score moyen de la fonction est passé de 39 points à 70 points en postopératoire. Le score moyen du genou est passé de 40 points à 84,9 points en postopératoire. L'angle fémoro-tibial moyen est passé de 177,7° en préopératoire à 178° en postopératoire.

Conclusion: L'ostéotomie tibiale de valgisation ne compromet la pose d'une prothèse totale de genou ultérieure. La connaissance des astuces et des pièges est le seul garant d'un bon pronostic

Mots-clés

Genou, arthrose, ostéotomie, tibiale, prothèse, pronostic

SUMMARY

Introduction: Total knee replacement after high tibial osteotomy becomes more and more indicated. This intervention needs to identify some pearls and pitfalls. The aim of our study was to evaluate results of total knee arthroplasty after closing wedge high tibial osteotomy.

Patients and method: Fourty total knee arthroplasty following closing wedge high tibial osteotomy were identified. Demographic features, tibio-femoral alignment and radiolucent lines were documented on postoperatively. Clinical and functional evaluations were performed preoperatively and postoperatively according IKSS score.

Results: The average duration of follow-up was 11, 5 years. The mean function score increased from 39 points to 70, 4 points postoperatively. The mean knee score increased from 40 points to 84, 9 points postoperatively. The mean average tibio-femoral angle was 177,7° in preoperatively and 178° (min 176°, max 185°) at the last follow-up.

Conclusion: The closing wedge high tibial osteotomy does not compromise subsequent total knee replacement. Knowing pearls and pitfalls lead to better outcome.

Key-words

Knee; arthritis; tibial osteotomy; arthroplasty; outcome.

High tibial osteotomies are well recognized surgical options for symptomatic femorotibial osteoarthritis in active and young patients [1, 2]. Medial femorotibial osteoarthritis is a usual problem in daily practice. In fact, in active patients with a life expectancy of nearly 20 years or more, osteotomies around the knee and especially high tibial osteotomies are generally available and well-accepted treatment that can lead to excellent pain relief and functional improvement [2]. However, deterioration of the results during the time has been reported and failure rate was estimated at nearly 24% at ten years follow up [3]. Hence, total knee arthroplasty can be used to solve these problems. Total knee replacement after high tibial osteotomy remains a subject of controversies due to anatomical modification of the knee. Reviewing the literature, most papers revealed good outcome especially of arthroplasty following closing wedge high tibial osteotomy [2]. Reviewing the literature, conflicting results have been reported concerning the results of total knee arthroplasty after previous high tibial osteotomy [4]. Several conclusions have been established but there are controversial and only little informations about long-term results of total knee arthroplasty after high closing wedge tibial osteotomy are available [5]. The aim of this study is to report results of total knee arthroplasty after previous closing wedge high tibial osteotomy.

METHOD

This is a retrospective study concerning total knee arthroplasty after high closing wedge tibial osteotomy. Inclusion criteria were: a minimum follow-up of over ten years, complete X-ray investigations with an anteroposterior and lateral knee views with a flexion of 30°, patellofemoral views and weight bearing long-leg anteroposterior radiographs. Exclusion criteria were incomplete X-ray findings, femoral osteotomy and impossibility to review patient at final follow up. In fact, we identified 40 consecutive knees in thirty-five patients who had been operated for knee arthrirtis with total knee arthroplasty after a previous closing wedge high tibial osteotomy according to Wagner recommendations [6]. Preoperative clinical evaluation concerned knee stability, mobility, and scars quality after high tibial osteotomy and time of devise removal after tibial osteotomy. Preoperative radiological evaluation was based on Ahlback [7] classification for femorotibial osteoarthritis and Iwano [8] classification for patellofemoral joint degeneration. All interventions had been performed by three experienced surgeons. Spinal anaesthesia was used for thirty-two cases and only eight cases needed a general anaesthesia for psychological reasons. Pneumatic tourniquet had been used for all knees. Needed ligament balancing and releases, mentioned in operative conclusions, were analyzed and evaluated. Reported difficulties were studied. All of arthroplasties were cemented and mobile bearing. Prophylactic antibiotherapy based on vancomycin had been indicated in all cases. During their hospitalization, prevention from thromboembolic complications was ensured with low molecular weight heparin and compression stockings. Physiotherapy and knee reeducation were indicated in all cases and started in the second day postoperatively. For the duration of six weeks, partial weight bearing of 20 kg with elbow crutches was required. X-rays were taken in two planes before total knee arthroplasty, postoperatively and at latest follow-up. Measurement of femorotibial angle was established on weight bearing long-leg anteroposterior radiographs. Evaluation of tibial slope, Insall Salvati ratio [9] and component replacement was based on X-ray views. Radiolucent lines at latest follow-up were documented according to the Knee Society total knee arthroplasty roentgenographic evaluation system [10]. Functional evaluations were performed preoperatively and postoperatively at the time of follow-up using the 200-point system of the Knee Society [11]. The collected data was analyzed using SPSS software v.17, mean, standard deviation, frequency, Pearson correlation coefficient; and t-test (p= 0.05).

RESULTS

This study concerned 40 cases. Total knee arthroplasty was bilateral in 5 patients. The average duration of follow-up after the total knee arthroplasty was 11, 5 years (min 10, max 15 years). There were 13 men and 22 women who had a mean age of 73, 5 years (min 61, max 83 years) at the time of the TKA. Knee replacement concerned 21 right knees and 19 left knees. The average duration between the knee arthroplasty and high tibial osteotomy was 10,8 years (min 6, max 17 years). The average body mass index (BMI) was 28, 9 kg/m² (min 24, 4, max 35, 6 kg/m²). According to Ahlback classification [7], 4 knees were grade 2, 28 knees were grade 3 and 8 knees were grade 4 before total knee arthroplasty. According to Iwano classification [8], 4 knees were grade 1, 19 knees grade 2, 13 knees grade 3 and 4 knees grade 4 .Mean range of flexion was 90° in preoperatively and improved to 110° in postoperatively. The mean Knee Society knee score increased from 40 points (min 18, max 60) before the arthroplasty to 84, 9 points (min 58, max 100) after TKA. The mean Knee Society function score increased from 39 points (min 10, max 60) preoperatively to 70,6 points (min10, max 100) postoperatively. Postoperative complications included two infections, 4 knees stiffness in which the physiotherapy was missed and incomplete, this stiffness were treated conservatively in three cases by intensive physiotherapy. Only one patient was re-operated for arthrofibrosis. Aseptic loosening had concerned the femoral component in 2 cases and the tibial component in three cases (figure1).

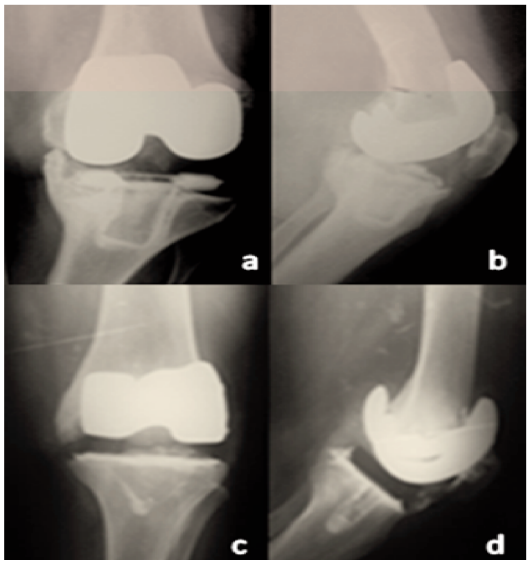

Figure 1: (a) and (b) anteroposterior and lateral views of the left knee revealing tibial component loosening with a varus deformation. (c) and (d) : anteroposterior and lateral views of the left knee with a loosening of the femoral component.

All of them needed surgical revision. The mean average femoro-tibial angle was corrected from177,7° (min 168°, max 192°) in preoperatively and 178° (min 176°, max 185°) similar to 2 ° of varus at the last follow-up (figure 2).

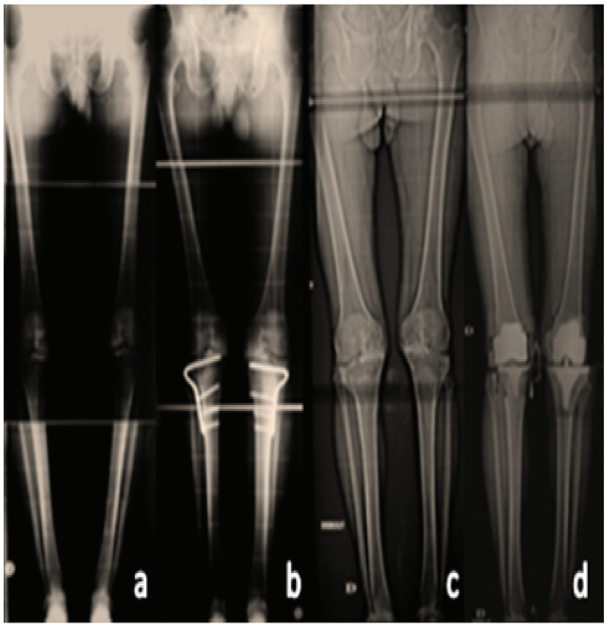

Figure 2 : Evolution of the femorotibial angle (a) : preoperative weightbearing long-leg anteroposterior radiographs with a femorotibial of 174°. (b) : post high tibial closing wedge osteotomy with a femorotibial angle of 179°. (c) : weightbearing long-leg anteroposterior radiographs after the removal of devices. (d) : weightbearing long-leg anteroposterior radiographs at last follow up with a femorotibial angle of 180°.

Fourteen patients had a valgus limb deformity less than 15° in preoperatively. Ligament balancing had concerned medial structures in 26 cases. No lateral approach had been used. Post operative mean femoral angle α was 87° (min 85°, max 94°) and mean tibial angle β was 91° (min 87°, max 93°). Translation of proximal tibia following high tibial osteotomy was found in 7 knees over than 10 mm in 5 cases (figure 3). Conflicting tibial component with the tibia was revealed in 5 cases. Patella infera was observed in our series since Insall Salvati Ratio [9] was found to be in decrease from 0,87 (min 0,68, max 1,22) in preoperatively to 0,82 (min 0,6, max 1,16) in postoperatively. Total knee arthroplasty had corrected tibial slope in all cases and mean value was 2,1° (min -2°, max +3°). Radiolucent lines according to the Knee Society total knee arthroplasty roentgenographic evaluation system [10] were revealed around 4 femoral components in which 2 had been diagnosed with aseptic loosening and around 5 tibial components in which only 3 had evoluted to aseptic loosening.

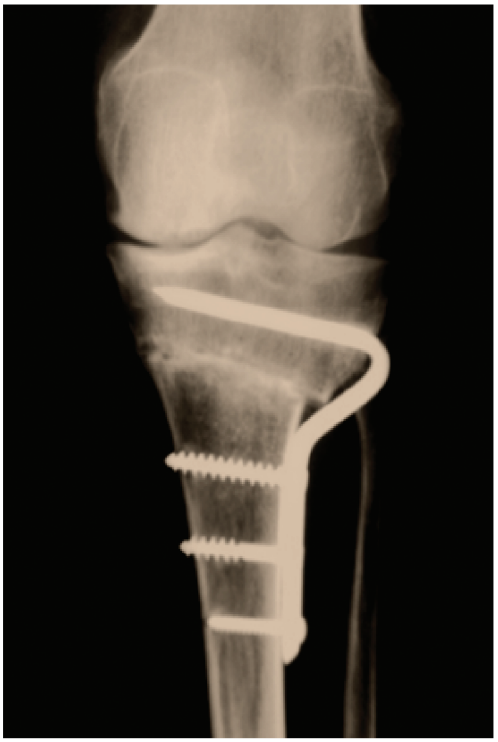

Figure 3 : Anteroposterior view of the left knee showing the epiphysis translation after the closing wedge osteotomy and the loose of bone stock in external compartment in comparaison to the internal compartment

DISCUSSION

Osteotomies around the knee are an available surgical treatment for femorotibial osteorthritis in young and active patients [1, 2, 12]. High tibial osteotomy is one option and results have been reported in several publications with a

high rate of good outcome especially when their indications are respected [3, 13]. Preoperative demographic characteristics of our series were similar to the most reported publications speaking about the same topic [12, 14]. The mean age of our patients was 73, 5 years which is similar to what have been reported through literature[12, 14,] The objective of both opening and closing wedge high tibial osteotomies is to transfer the load stresses from the medial region of the degenerated knee to the healthy side [14]. In spite of good outcome of these osteotomies in short and mid-term follow up, long term evolution is less evaluated and outcome is often under estimated [5,15]. In front of progressive arthritic deterioration of all knee compartments, surgical revision is discussed and conversion to total knee arthroplasty is advocated [2, 15, 16]. Several studies have been published evaluating results of total knee arthroplasty after high tibial osteotomy with controversial conclusions and different outcomes [16]. Few publications have reported results of knee replacement after one kind of high tibial osteotomy and some of them have discussed only opening wedge osteotomy [17]. To our knowledge, our series is considered to be with the earliest series studying long-term results of total knee arthroplasty following closing wedge high tibial osteotomy using Wagner's technique. Outcomes were different, lower rate of satisfactory results was reported by Windsor [18] some technical difficulties had been revealed in relationship to surgical exposure of the knee explained by low patella frequently observed after high tibial osteotomy, which reached 80% in his series. In comparison to opening wedge osteotomy, patella height seems to be conserved in closing wedge osteotomy [18, 19]. Alterations related to patella height seem to be linked to the surgical technique. [18]. Wagner's [6] recommendations used to make a closing wedge high tibial osteotomy explain the absence of major difficulties during total knee arthroplasty in contrast to opening wedge osteotomy. [20] Wagner's osteotomy is performed below the tibial tuberosity, so that patellar height is not concerned. In our series, closing wedge osteotomy had never explained any patella infera. Nevertheless, we have found that patellar height had to decrease after total knee arthroplasty without an abvious patella infera observed after opening wedge osteotomy. The major patellofemoral problem is patellar congruency with neotrochlea needing sometimes lateral patellar retinaculum release. Later complications of total knee arthroplasty after high tibial osteotomy, were similar to first intention arthroplasty consisting on septic and aseptic loosening [4, 21]. The rate of infection is similar to the first intention arthroplasty [4, 18, 21]. However, radiolucent lines are frequently seen compared to the first time replacement [18] so that total knee arthroplasty must be followed-up carefully with respect to numerous radiolucent lines, which have not progressed so far. The absence of major anatomical modifications of the proximal tibial extremity in closing wedge osteotomy explains the rarity of difficulties during arthroplasty. Several series had reported good outcome of total knee arthroplasty after closing wedge high tibial osteotomy [22, 23]. Amendola [14] published satisfactory results of total knee arthroplasty after proximal tibial osteotomy in 96.5% of cases over a mean follow-up of 97 months. Comparison between total knee arthroplasty after high tibial arthroplasty and first time one, had been reported [4,21]. In our experience, we didn't found a difference at long term follow up between first time and after high tibial osteotomy of the total knee arthroplasty. Amendola [14] had concluded that there is no difference in clinical and radiological results apart from a greater rate of anterior knee pain and revision for secondary resurfacing of the patella in the patients with previous high tibial osteotomy. On the other hand, Amendola [14] recommended respecting the scars and conserving a distance of 7 cm between the last scar and the new approach which could be more difficult and required the skills of experienced surgeons especially using closing lateral techniques. Occurrence of these difficulties is more frequent if the removal of fixation devices is performed simultaneously to total knee arthroplasty [24]. Majority of publications recommended the removal of plates and osteosynthesis devices before total knee arthroplasty [24, 25]. Interval between removal of devices and total knee arthroplasty was not clearly defined in the literature [25]. Recently, Bae [23] published good or excellent results at an average follow-up of 4.7 years after total knee arthroplasty following closed wedge high tibial osteotomy in 16 cases. Our study has some limitations as it is a retrospective study and the number of patients is small. However, we have presented the long-term results and the patients of this study had good or excellent results at an average follow-up of 11.5 years. The conclusion is that high tibial osteotomy does not have significant negative effect on later total knee arthroplasty.

CONCLUSION

Total knee arthroplasty following closing wedge high tibial osteotomy is an available option of treatment in patients with evoluted knee arthritis. Several difficulties have been described. However, the evolution of biomaterials and prothesis industry has improved the quality of this surgery.

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