TREATMENT OF OSTEOARTHRITIS OF THE KNEE WITH VALGUS DEFORMITY BY MEANS OF VARUS OSTEOTOMY

L. A. MARIN MORALES, L. A. GOMEZ NAVALON, P. ZORRILLA RIBOT, J. A. SALIDO VALLE

Nineteen cases of osteoarthritis of the knee with valgus deformity in 17 patients were treated by femoral supracondylar varus osteotomy (17 cases) or by high tibial varus osteotomy (2 cases) over the last 15 years. Fixation was performed using a 95° AO blade-plate in 13 of the femoral osteotomies and a straight plate in the other four. The mean follow-up time was 6.5 years. The valgus deformity was idiopathic in 14 cases, secondary to rheumatoid arthritis in 2 cases and to tibial valgus in one case. The Hospital for Special Surgery (HSS) score was used to evaluate the clinical results : nearly 75% were excellent or good. The causes related to poor results are analyzed regarding indication and surgical technique. It appears that varus osteotomy is an effective procedure for the treatment of osteoarthritis of the knee with valgus deformity, above all in order to alleviate pain, although the operation requires precision, and correct selection of patients is of prime importance.

Keywords : knee ; varus osteotomy ; genu valgum.
Mots-clés : genou ; ostéotomie de varisation ; genu valgum.

INTRODUCTION

Valgus deformity of the knee, whether constitutional or secondary to trauma is much less frequent than varus deformity. Surgical treatment of genu valgum by osteotomy therefore creates dilemmas concerning its indication. This appears to have been resolved in the case of genu varum. Valgus proximal tibial osteotomy has been shown to be an effective procedure for the correction of the deformity and for the alleviation of the pain associated with osteoarthritis of the medial tibiofemoral compartment. Tibial varus osteotomy for valgus deformity has not provided such favorable results. Varus femoral supracondylar osteotomy is an alternative to tibial osteotomy. In the majority of cases, the valgus deformity has its origin in the femur, and therefore, from a biomechanical viewpoint, realignment should take place at the femur (10, 11, 13, 14). Coventry stated that valgus deformities exceeding 12-15° should rarely be corrected by means of varus tibial osteotomy (2).

We have reviewed our own experience with distal femoral and proximal tibial varus osteotomy to evaluate its efficacy and to better determine its role in the treatment of painful valgus deformity of the knee.

MATERIAL AND METHODS

A total of 19 varus osteotomies in 17 patients (including 2 bilateral cases) were carried out in our department from 1982 through 1998 . The mean age at the time of treatment was 55 years, with a range from 50 to 72 years. Twelve patients were female and the remaining 5 were male. The mean length of follow-up was 6.5 years, with a range from 2 to 15 years.

The etiology was idiopathic genu valgum in 16 cases, rheumatoid arthritis in 2 cases and tibial valgus in one case. The two deformities associated with rheumatoid arthritis of the knee occurred in the same patient.

Department of Orthopedic Surgery, Complejo Hospitalario Ciudad Real (Spain).

In 17 cases, realignment was achieved by femoral supracondylar osteotomy (fig. 1, 2, 3). The osteotomy was fixed in 13 using a 95° AO blade-plate and in the remaining 4 cases using a straight plate. A graft was used in 2 cases. A lateral approach was used in all cases. Varus proximal tibial osteotomy was used in the remaining two knees (fig. 4, 5, 6), and the osteotomies were fixed in both cases using staples.

Fig. 1. — Genu valgum deformity exceeding 12° with lateral osteoarthritis.

The Hospital for Special Surgery (HSS) knee-rating score was used for preoperative and postoperative evaluation. This rating system allots a maximum of 100 points, which are subdivided into six categories: pain, function, range of motion, muscle strength, flexion deformity, and instability. From the total points obtained, subtractions are made for walking aids, extension lag, and varus or valgus deformity. The final total is the knee rating. We designated as excellent those knees with a rating of 90 or more. Knees with ratings of 80 to 90 were considered to have a good result. We designated as fair those knees rated below 80 points.

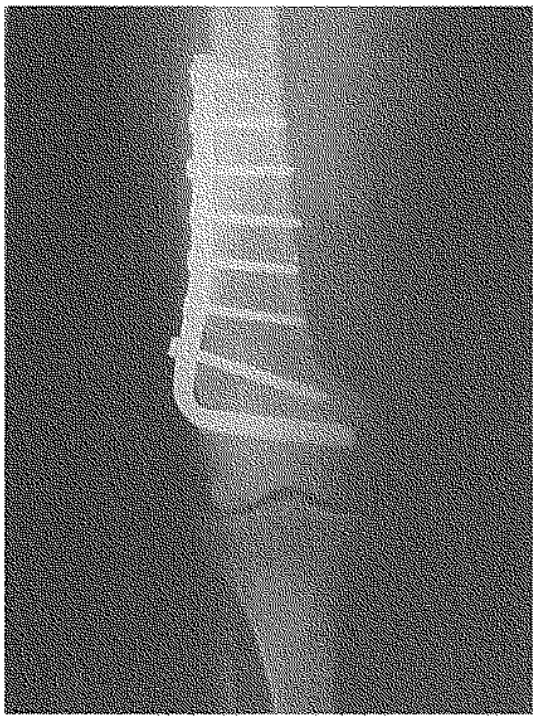


Fig. 2. — Femoral supracondylar osteotomy. Immediate postoperative film.

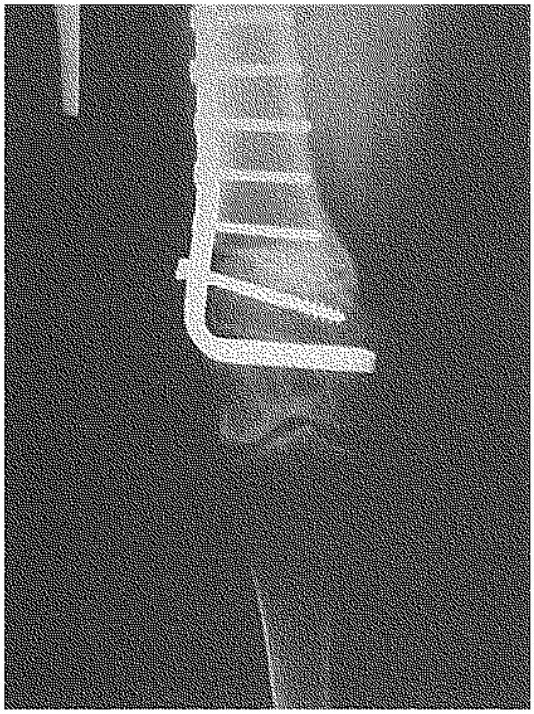


Fig. 3. — Evaluation after 3 years. Consolidation and good correction.

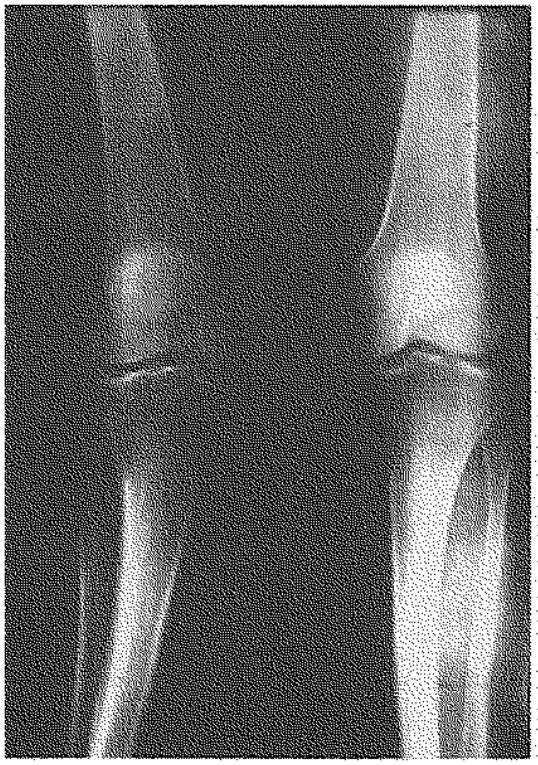
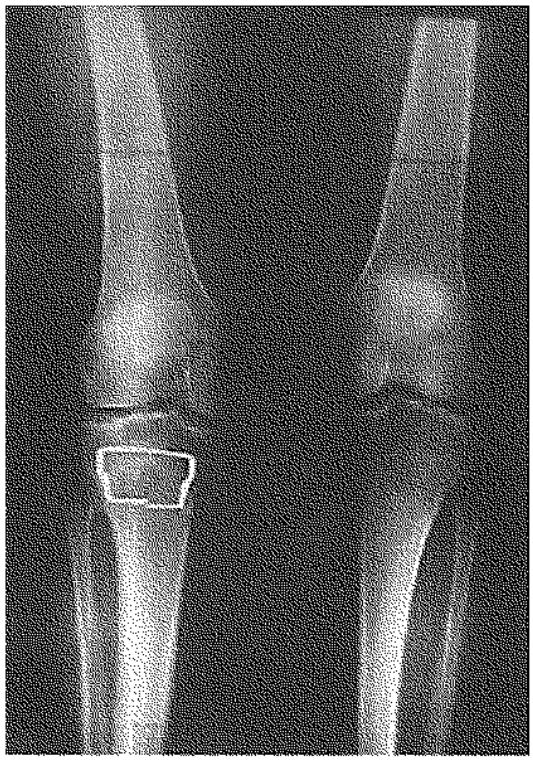


Fig. 4. — Genu valgum. Tibia valga.

Fig. 5. — High tibial osteotomy. Immediate postoperative film.



RESULTS

The postoperative results were rated as excellent in 5 cases (26.4%), good in 9 cases (47.2%) and fair/poor in 5 (26.4%). All cases except one presented marked improvement with respect to their preoperative condition. The HSS knee score improved from an average of 47.5 points (range, 36 to 67 points) preoperatively to 83.3 points (range, 57 to 97) postoperatively. The mean length of follow-up was 6.5 years. The most significant results were achieved in alleviation of pain, the score rising from a preoperative level of 8.1 (based on a maximum of 30 points) to a postoperative score of 23.9. Function was also considerably improved, the score rising from 11.7 (based on a maximum of 22) to 18.8. The results were less positive with respect to the range of motion, with a score rising from a preoperative 12.4 to 12.8 at final evaluation.

←

Fig. 6. — Evaluation after 5 years. Consolidation and normal correction.

Valgus angulation of the knee was measured using standing anteroposterior radiographs; these radiographs were used to measure the tibiofemoral angle. A limb with a normal, straight mechanical axis has a tibiofemoral angle of 6° of valgus. In our series of 19 varus osteotomies, the tibiofemoral angle was corrected from a preoperative average of 16° of valgus (range, 10 to 27°) to a postoperative average of 1° of valgus (range, 10° of varus to 8° of valgus). In the preoperative planning a normal correction or a slight overcorrection (4°) was sought, although this was not achieved in all cases owing either to defective technique (2 cases) or to poor planning (2 cases).

Concerning the 13 patients who had undergone supracondylar osteotomy using a 95° AO blade-plate, excellent results were achieved in 4 cases, good in 5 and fair/poor in 4 cases. In the 4 cases in which the osteotomy was fixed using a straight plate, good results were obtained in 3 cases and a poor result in one case. Favorable results were obtained in the 2 patients who had undergone varus proximal tibial osteotomy.

With respect to the axis correction obtained, poor results were noted in those cases in which undercorrection (more than 5° of valgus) or overcorrection (greater than 5° of varus), was achieved (fig. 8). Using age at operation as a reference, poor results were obtained in two patients over the age of 70 years, while the best results were achieved in patients between 55 and 65 years, who also benefited from more appropriate surgical corrections (fig. 7). Analyzing the two parameters together showed that the prognosis in patients over 70 years of age was poorer, because, despite the achievement of a satisfactory correction immediately following the operation, their poor bone quality led to a progressive loss of correction.

The principal postoperative complications were two cases of intolerance to the material (persistent discomfort), with deep infection in one of them. Both required removal of the blade plate but nevertheless progressed satisfactorily. We noted one case of superficial infection by *Staphylococcus epidermidis*, which was resolved by antibiotic treatment. There were no cases of nonunion.

Two patients presented associated pathology consisting of a degenerative meniscus tear without mechanical signs. Combined arthroscopic treatment was not performed, since it was judged that the axis correction was sufficient. Good results were obtained in both cases.

DISCUSSION

Osteoarthritis of the knee with valgus deformity is not looked upon with favor by the scientific community with respect to the clinical results obtained

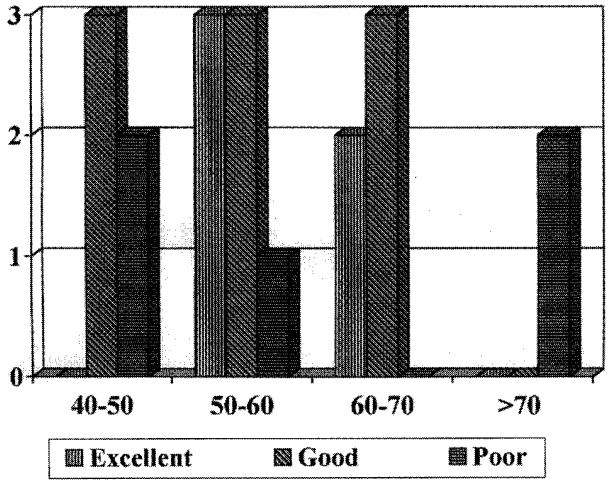


Fig. 7. — Evaluation of results according to age.

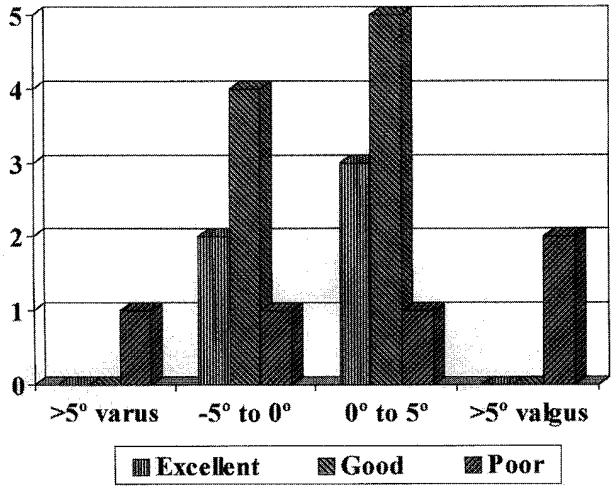


Fig. 8. — Analysis of results according to postoperative angle correction.

by correction by osteotomy, tibial as well as femoral. The treatment of choice has usually been total arthroplasty. In North America distal femoral varus osteotomy for genu valgum had not been studied extensively until the present decade, as evidenced by the work of Johnson and Bodell, who refer to the discouraging results of the latter treatment (7).

A biomechanical study carried out by Maquet (10, 11) of varus and valgus deformities of the knee suggests that load transfer is not the same in varus as in valgus osteotomy. Following a varus osteotomy there is a transfer of load from the lateral compartment to the intercondylar region and the medial compartment, although a significant load remains on the lateral compartment. If a high tibial osteotomy is carried out, the resultant force through the knee is oblique with respect to a plane tangential to the tibial plateaus, whereas if the osteotomy is carried out at the supracondylar level the resultant force is perpendicular to this plane. As a result, Maquet generally recommends a femoral supracondylar osteotomy with slight overcorrection, with the object of diminishing considerably the pressure on the joint and distributing the loads uniformly.

Corrective osteotomy at the tibial level, although it results in obliquity of the joint line, has provided good results following the criteria of Coventry, who recommends it when the valgus deformity is less than 12° (2), but our experience is limited and does not allow us to reach conclusions. When the obliquity is greater, the added subluxation of the femur over the tibia can hamper the function. Therefore, distal femoral osteotomy is recommended, which may be at the supracondylar level, whether it be the classical osteotomy of addition or subtraction (3, 12) cylindrical osteotomy (16) or the less used unicondylar osteotomy of Debeyre (6).

Healy *et al.* claimed good or excellent results with supracondylar osteotomy in 83% of their cases, although they did not recommend it for patients with rheumatoid arthritis or for those with a poor preoperative range of motion (5).

Ruiz Valdivieso *et al.* in a study of 21 varus osteotomies, obtained good results in 50% of tibial osteotomies and in 33% of femoral osteotomies (13). In spite of these results, they advise the use of supracondylar femoral osteotomy owing to the difficulties involved in obtaining appropriate correction by tibial osteotomy.

Edgerton *et al.* achieved better results by femoral osteotomy, good or excellent results in 71% of the cases, although, strangely, they reported a large number of complications, including nonunions (25%) and loss of correction (21%) (3).

McDermott *et al.* in a series of 24 cases of supracondylar osteotomies, obtained good results in 92% of the cases (12). In all these cases, overcorrection of the femorotibial angle to more than 175° was made.

Mathews *et al.* in a recent study, commented on the disparity in the results depending on the rating scale employed, HSS or Knee Society Clinical Rating, although neither revealed more than 60% good results (9).

In our follow-up study, excellent and good clinical results were obtained in 73.6% of the cases and 94% of the patients reported improvement with respect to the preoperative condition.

The best results have been obtained within an age range of 50-70 years, whereas poor results were achieved in all patients over 70 years of age. Concerning postoperative correction, it was observed that when the angle was between 175° and 185°, good results were obtained in 85% of the cases. On the other hand, if undercorrection (>5° valgus) or overcorrection (> 5° varus) was achieved, failure was usual, irrespective of the age of the patient, and it may therefore be assumed that appropriate correction is absolutely essential in order to obtain the best clinical results.

With respect to the surgical technique employed, no significant differences were found, and although with varus tibial osteotomy good results were obtained in the two cases, the number is too small to allow conclusions to be drawn.

In relation to the frequent association with degenerative meniscus pathology, action taken upon the menisci is considered to be beneficial if mechanical signs relating to their tearing exist (17). No action was taken in the two cases in which genu valgum was associated with degenerative torn

menisci, confirmed by MRI, since no mechanical symptoms were present. In these circumstances, the favorable results obtained may corroborate the policy of nonintervention.

Poor results have been associated with inadequate patient selection, negative prognosis factors such as obesity, advanced age, severe osteoporosis and massive destruction of the lateral compartment. In addition, poor results may arise from inadequate surgical correction.

CONCLUSIONS

In view of the results, varus osteotomy as treatment for osteoarthritis of the knee with genu valgum deformity is an effective surgical procedure. It is recommended for young, active, not overly obese patients when the lateral compartment has been moderately affected. In those cases with less than 12° of valgus, we recommend osteotomy at the tibial level, and when it is greater than 12°, the femoral supracondylar level is recommended. Precise surgical technique is required in order to obtain the appropriate correction (1, 4, 8, 15).

REFERENCES

1. Berruto M., Bianchi M., Laura G. Surgical treatment of arthritic valgus knee: Femoral supracondylar osteotomy or knee replacement?. Ital. J. Orthop. Traumatol., 1993, 19, 33-41.
2. Coventry M. B. Osteotomy about the knee for degenerative and rheumatoid arthritis. J. Bone Joint Surg., 1973, 55-A, 23-48.
3. Edgerton B. C., Mariani E. M., Morrey B. F. Distal femoral varus osteotomy for painful genu valgum. A five to 11 year follow-up study. Clin. Orthop., 1993, 288, 263-269.
4. García García J. A., Rius Dalmau M., Cabot Dalmau J., Jimeno Urbán F. Tratamiento del genu valgo. Revisión 19 osteotomías de varización. Avances Traum., 1994, 24, 39-44.
5. Healy W. L., Anglen J. O., Wasiliewski S. A., Krackow K. A. Distal femoral varus osteotomy. J. Bone Joint Surg., 1988, 70-A, 102-109.
6. Hernigou P., Goutallier D., Debeyre's unicondylar osteotomy. Results in the treatment of lax arthritic genu valgum. Rev. Rhum. Mal. Ostéoartic., 1988, 55, 569- 575.
7. Jonhson E. W. Jr., Bodell L. S. Corrective supracondylar osteotomy for painful genu valgum. Mayo Clin. Proc., 1981, 56, 87-92.
8. Learmonth I. D. A simple technique for varus supracondylar osteotomy in genu valgum. J. Bone Joint Surg., 1990, 72-B, 235-237.
9. Mathews J., Cobb A. G., Richardson S., Bentley G. Distal femoral osteotomy for lateral compartment osteoarthritis of the knee. Orthopedics, 1998, 21, 437-440.
10. Maquet P. The treatment of choice in osteoarthritis of the knee. Clin. Orthop., 1985, 192, 108-112.
11. Maquet P. Traitement chirurgical de l'arthrose fémorotibiale. Acta Orthop. Belg., 1982, 48, 172-189.
12. McDermott A., Finklestein J. A., Farine I., Boynton E. L., Macintosh D. L., Gross A. Distal femoral varus osteotomy for valgus deformity of the knee. J. Bone Joint Surg., 1988, 70-A, 110-116.
13. Ruiz Valdivieso T., Vega Castrillo A., Pareja Corzo L., De Miguel Vielba A. Osteotomia varizante como tratamiento del genu valgo artrmity of the knee. J. Bone Joint Surg., 59-62.
14. Sanchez Martín M., Ruiz Valdivieso T. Osteotomia supracondilea femoral varizante. In : Cirugía de la rodilla (Ed. Jims). Josa, S., de Palacios, J., (eds.), Barcelona 1995, pp. 413-417.
15. Terry G. C., Cimino P. M. Distal femoral osteotomy for valgus deformity of the knee. Orthopedics, 1992, 11, 1283-1289.
16. Weill D., Jacquemin M. C. L'ostéotomie cylindrique fémorale supracondylienne de varisation dans le traitement chirurgical de la gonarthrose. Acta Orthop. Belg., 1982, 48, 110-130.
17. Yang S. S., Nisonson B. Arthroscopic surgery of the knee in the geriatric patient. Clin. Orthop., 1995, 316, 50-58.

SAMENVATTING

L. A. MARIN MORALES, L. A. GOMEZ NAVALON, P. ZORRILLA RIBOT, J. A. SALIDO VALLE. Behandeling van arthrotische valgus knie met correctieve varus osteotomie.

Bij 17 patiënten met 19 arthrotische valgusknieën werd een supracondylaire varus osteotomie uitgevoerd (17 ×) of een hoge tibia variserende osteotomie (2 ×) en dit in de laatste 15 jaar. De fixatie gebeurde 13 × in de femur osteotomie met een 95° AO plaat en met een rechte plaat bij de 4 overige. De gemiddelde follow-up bedroeg 6.5 jaar. De valgus was ideopatisch in 14, 2 maal ten gevolge van reumatoide arthritis en éénmaal ten gevolge van tibia valgus. Met de HSS-score (hospital for special surgery) was het resultaat goed tot uitstekend in bijna 75% der gevallen.

Bij de slechte gevallen werd indicatie en operatietechniek nagegaan.

Het lijkt erop dat een variserende osteotomie voor de degeneratieve valgusknie effectief is in de pijnbestrijding doch dat een rigoureuze techniek en indicatiestelling vereist is.

RÉSUMÉ

L. A. MARIN MORALES, L. A. GOMEZ NAVALON, P. ZORRILLA RIBOT, J. A. SALIDO VALLE. L'ostéotomie de varisation dans le traitement de la gonarthrose avec désaxation en valgus.

Les auteurs ont traité 19 cas de gonarthrose avec désaxation en valgus chez 17 patients par ostéotomie fémorale supracondylienne de varisation (17 cas) ou par ostéotomie tibiale haute de varisation (2 cas) au cours des 15 dernières années. Les ostéotomies fémorales ont été fixées par une lame-plaque AO à 95° dans 13 cas et par une plaque droite dans les 4 autres cas. Le suivi moyen est de 6,5 ans. La désaxation en valgus était idiopathique dans 14 cas, secondaire à une arthrite rhumatoïde dans deux cas et à un valgus tibial dans un cas. Le score du Hospital for Special Surgery (HSS) a été utilisé pour évaluer les résultats cliniques : près de 75% étaient bons ou excellents. Les auteurs ont analysé les facteurs qui, dans l'indication et la technique chirurgicale, étaient associés à de mauvais résultats. Ils concluent que l'ostéotomie de varisation est un traitement efficace de la gonarthrose avec désaxation en valgus, en particulier sur le plan antalgique, mais cette intervention requiert de la précision et impose une sélection correcte des indications.