

# Total ankle arthroplasty in under 50-year-old patients. Ten years follow-up. Retrospective analysis

## Protesis de tobillo en pacientes de menos de 50 años con 10 años de seguimiento. Analisis retrospectivo

Mariano Núñez-Samper<sup>1</sup>, Guillermo Parra<sup>1</sup>, Eldis Lao Duran<sup>1</sup>

### Keywords:

Arthroplasty, replacement ankle;  
Ankle joint/surgery;  
Prostheses and implants;  
Follow-up studies; Adolescent

### Descriptor:

Artroplastia de reemplazo de tobillo;  
Prótesis e implantes; Estudios de  
seguimiento; Adolescente

<sup>1</sup> Orthopedic Surgery and  
Traumatology Service, Virgen del Mar  
Hospital, Madrid, Spain.

### Corresponding author:

M. Nuñez-Samper MD.Ph.D.  
Calle de Honduras, 14, 28016  
Madrid, Spain  
Phone: 34667776050/34913539500  
E-mail: mnusamp1@nunezsamper.com

**Conflicts of interest:**  
none

**Received on:**  
March 11, 2017

**Accepted on:**  
April 12, 2017

### ABSTRACT

**Objective:** Age below 50 years has traditionally been considered a contraindication for total ankle arthroplasty, considering excessive the use and stress it undergoes in this particular group, favouring an early implant loosening and therefore arthrodesis has been considered as “gold standard”. In this paper we report the results of a ten-year follow-up of ten under 50-year-old patients who underwent total ankle arthroplasty. **Methods:** Clinical, functional and radiological results have been recorded and analysed, as well as the complications arises with both implants used, Ramses II (FH orthopedics) and Star Tm (SB Inc). **Results:** Preoperative AOFAS score ranged from 30 to 70 points, with a mean score of 57.4, as opposed to 25 to 83 points at 10 year follow-up. Range of motion ranged between 20 to 30° at pre-operative evaluation, improving to 45-55° at follow-up, showing an improvement of 25°. Three patients (30%) reported no pain at 10 years, whilst 40% reported occasional pain, 20% moderate pain and 10% endured severe pain, with low impact on daily activities. 90% returned to normal life and 30% returned to sports (ski, tennis...) although not at the same level. The level of satisfaction was very high in 10%, moderate in 60% and low or unsatisfied in 20%, similar to other series in literature. **Conclusion:** At mid-term follow-up, we have found ankle replacements to produce the same results in terms of complications and outcome as in older patients' groups. Therefore, indication criteria have to be strict and restricted to patients where solid implantation of the prosthesis can be expected.

Level of evidence: IV<sup>th</sup>

### RESUMEN

**Objetivos:** La artroplastia total de tobillo en pacientes por debajo de 50 años, ha sido considerada tradicionalmente una “contraindicación quirúrgica”, alegando como causa el excesivo estrés en el tiempo a que se sometían los componentes y que podrían en alguna medida favorecer su aflojamiento, por lo que la artrodesis en estos casos era el tratamiento de elección. En los últimos años la prótesis de tobillo ha resurgido como alternativa a la artrodesis ofreciendo mejores resultados funcionales, por lo que ha empezado a considerarse que lo que antes era una indicación excepcional, ahora puede ser primaria. Los pacientes jóvenes con artrosis, habitualmente postraumática o artritis reumatoide, son las dos indicaciones principales, no obstante para muchos autores todavía, la artrodesis sigue siendo “el patrón oro” en estos casos. Este trabajo expone los resultados de la evolución durante 10 años de 10 pacientes menores de 50 años, a los que se les implanto una prótesis total de tobillo. Actualmente tienen 10 años más. **Métodos:** Hemos analizado el resultado clínico, funcional y radiológico, así como las complicaciones surgidas de los dos modelos de prótesis que en esa época usábamos: la prótesis Ramses ii (FH Ortopedics) y la Star Tm Ankle (SB Inc.). **Resultados:** Se hizo una valoración AOFAS preoperatoria que oscilo entre 30 y 70 puntos con una media de 57.4 puntos, así como una valoración postoperatoria 10 años después, que fluctuó entre 25 y 83 puntos. El rango del arco de movimiento preoperatorio (flexión dorsal/plantar) oscilo entre 20° y 30° y diez años después entre 45° y 55°, mejorando la movilidad en 25°. Tres pacientes, un 30%, refirieron a los 10 años que no habían tenido dolor, un 40% dolor esporádico, un 20% moderado y un 10% dolor serio pero que les afectaba escasamente en sus funciones habituales. Un 90% volvieron a hacer vida normal y un 30% deporte, esquí y tenis, pero no al mismo nivel. El grado de mejoría de la capacidad física y la marcha fue muy alto en un 10%, un 60% resultaron satisfechos, un 10% mostraron una satisfacción moderada y un 20% insatisfechos, siendo estos resultados semejantes a los presentados en otras publicaciones. **Conclusión:** A medio plazo hemos podido comprobar que las prótesis de tobillo implantadas en gente joven, presentan los mismos resultados y complicaciones que en pacientes de más edad, por lo que, aunque la indicación deberá seguir siendo estricta y restringida, debiera ser revisada, teniendo indicación sobre todo, en aquellos casos en que se prevea que el implante va a tener muchas posibilidades de integrarse de forma definitiva.

## INTRODUCTION

Under 50 year-old patients suffering from ankle arthropathy associate specific factors that must be taken into account when indication is stated. Loss in quality of life is mainly due to pain, functional impairment, decay in working, physical and sporting activities. Those are the factors that need to be prioritarily taken into consideration, for they are the main concern expressed by this group of patients.

The important presence in the media of ankle prosthesis,<sup>(1-5)</sup> has determined younger patients with active lifestyles to demand mobility at their ankle, as opposed to a fixation. These are patients suffering from posttraumatic osteoarthritis who have experienced decay in quality of life, presenting difficulty for walking and limitation of their range of movement but reasonably preserving biomechanics, with appropriate passive structures.

Kofoed et al. in 1999,<sup>(6)</sup> over 100 Star<sup>®</sup> third generation total ankle replacements, implanted between 1981 and 1996 with a mean follow-up between 1 and 15 years, report good results, comparable to over 50 year-old patients, in the younger age group.

Spirt et al. in 2004,<sup>(7)</sup> report similar results in a series of 306 Agility<sup>®</sup> arthroplasties between 1995 and 2001, where they had to lament 28% of failures. Revision rate was equal in both age groups.

Hinterman in 2004<sup>(8)</sup> also reports 84% good results at short term with Hintegra prosthesis implanted in 122 ankles. His series included younger patients, although he didn't specify the number.

In 2008, Kofoed<sup>(9)</sup> reports again on Star<sup>®</sup> prosthesis, in a series comparing under and over 50 year-old patients, confirmed the aforementioned results. In the under 50-year-old patients group the implant produced a survival rate above 6 years in 75%, whilst on the above 50-year-olds it happened in 80%. With regards to mobility, the differences between age groups, evened up as time went by.

Saltzman and Mann in 2009<sup>(10)</sup> report results comparing arthroplasty versus ankle arthrodesis in a multicentric series with a mean age of 63 in the arthroplasty group and 57 for arthrodesis, concluding that, at 2 years follow-up, level of pain and functional activity were equal in both groups, being complication rates also comparable (6.5%-6.9%).

Recently, Rodríguez Pinto et al.<sup>(11)</sup> report a multicentric study on Salto<sup>®</sup> third generation prosthesis, studying two patient groups with ankle arthritis. 31 under 50 years of age and 72 over that age and a mean follow-up of two years.

They obtained an improvement in AOFAS scores in both age groups, although this was more significant in the below 50-year-old patient group (62.8 *vs* 66.8). When comparing range of movement, results were also more significant in the below 50-year-old age group (21.8 *vs* 17.7°). Complication rate was comparable in both groups (6.5 - 6.9%).

With regards to ethiology, all literature agrees on the most common cause, also matching our experience, with an 80% of cases being post-traumatic. Amongst these, bimalleolar fractures are the most common cause (4-4 B y 4-4 C - AO score), accounting for 18% of the cases, as well as tibial plafond fractures.

Inflammatory arthropathies, including rheumatoid arthritis, are less common and have a lower incidence. Indication on these patients arises from a great functional impairment often with bilateral involvement. Ankle pathology adds to incapacity and hampers a comfortable daily life. In some occasions, surgery is conditioned by the existence of an ankle arthrodesis at the contralateral ankle.<sup>(12-14)</sup>

## METHODS

We report a 10 year follow-up on a series of 10 patients undergoing total ankle replacement between the years 2000 to 2005, all of them operated on by the same surgical team.

Main etiology was found to be post-traumatic, following ankle fracture in 60%, followed by primary osteoarthritis in 30% and rheumatoid in 10% (Table 1).

Patients were retrieved from a series of 27 ankle replacements during that period. We found 7 men (70%) and 3 women (30%). Age ranged from 29 to 50 years, with a mean of 43.4. 70% were post-traumatic, 20% were primary and 10% were rheumatoid in origin. Mean follow-up was 10.9 years.

In our study radiology was assessed, as well as functional and clinical outcome, following AOFAS score for ankle. Range of movement was also recorded. We consider normal values 100 points for AOFAS score and 20° dorsiflexion and 40° plantar flexion with a 60° overall range of movement arch for the functional scale.

Preoperative data and those retrieved at ten years were compared. That would allow us to compare the performance of the implant during that time. Also on X rays radiolucency was checked for, as well as cysts.

Two different prosthesis were implanted, Ramses II cemented FH. Orthopedics, (8 cases 80%) and Star Tm Ankle uncemented SB Inc. (2 cases 20%).

**Table 1.** Summary of information, diagnose, model, follow-up, pain and complications

Nº	Age	Sex	Diagnostic	Model	Follow	Pain	Complications
1	29	F	Art. post.	Ramses	13	Esporadic	No
2	46	M	Art. post.	Ramses	10	Esporadic	No
3	48	M	Art. post.	Ramses	10	Moderated	Collapse
4	32	M	Art. post.	Ramses	10	Moderated	Polyeth.
5	43	F	Art. post.	Ramses	14	No	Collapse
6	50	M	Prim. artr.	Ramses	12	Esporadic	No
7	50	F	Art. rheu.	Ramses	10	No	No
8	49	M	Art. post.	STAR	10	No	No
9	38	M	Prim. artr.	STAR	10	Esporadic	No
10	49	M	Prim. artr.	Ramses	10	Serious	Arthrodesis

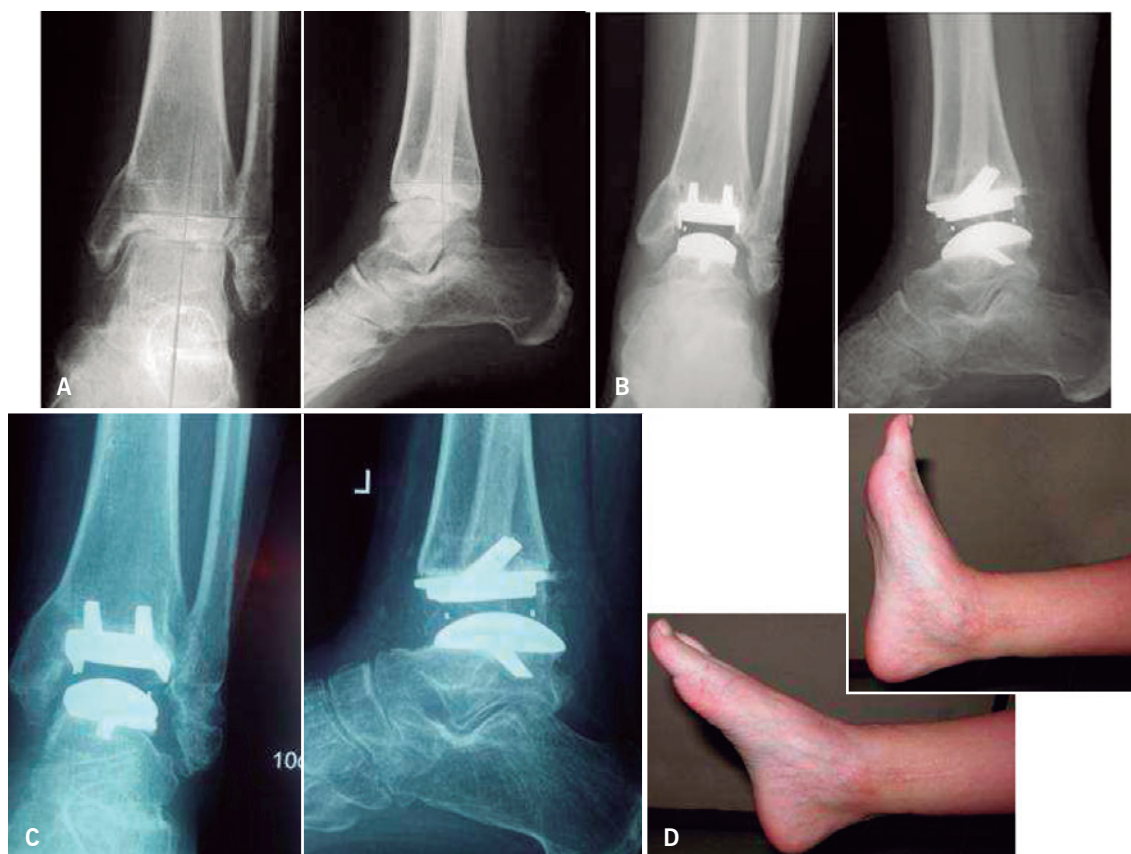
Art. post.: osteoarthritis posttraumatic; Prim. artr.: primary osteoarthritis; Art. rheu.: reumatoid arthritis.

Surgical technique was standard for all cases through an anterior approach.

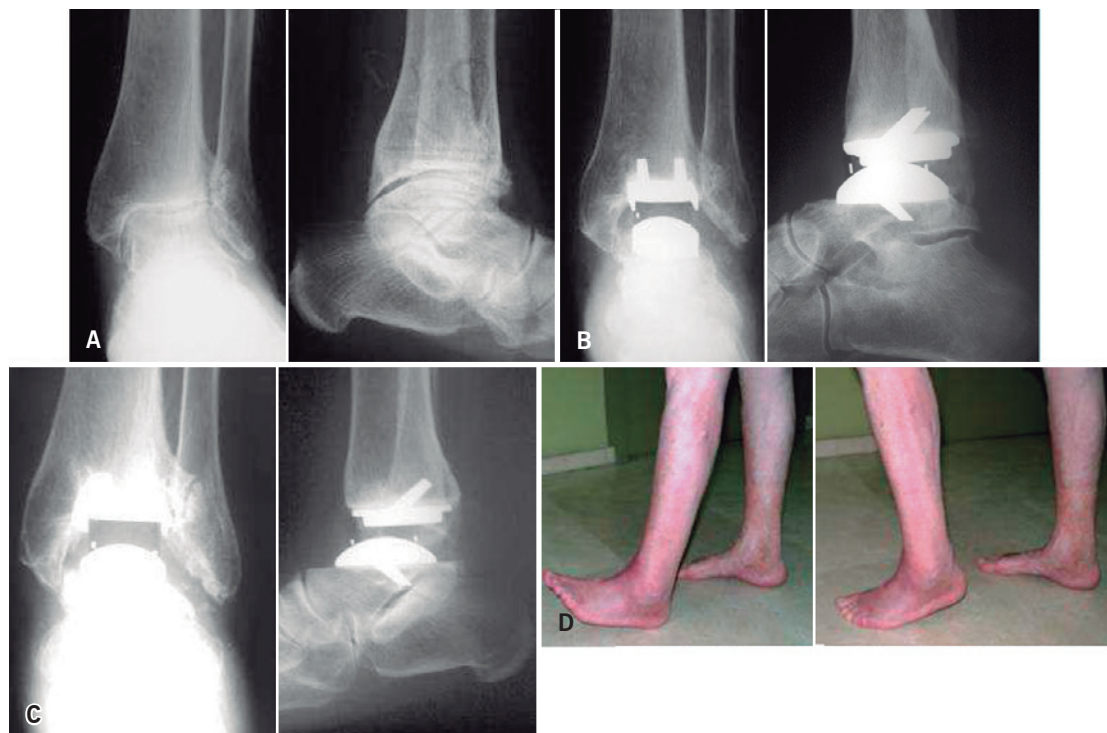
Retrospective analysis was performed taking as a landmark 2015, when all of them were over 10 years since implantation (Figures: Cases N.1 to N.10).

## RESULTS

Although we acknowledge that this is a short series, we believe it to be interesting as long as it shows a long follow up, undertaken by the same team, which has allowed us to gauge not only clinical end functional



**Figure 1.** Female, 29 Years old. Surgery 2002 for osteoarthritis (AO) secondary to ankle fracture. Ramses Prosthesis (TAR), 13 years' follow-up. Normal daily living. Walks on low heels, doesn't do sports, occasional pain, subtle functional limitation, office work stable. A) Preoperative X-ray; B) Check X-ray; C) X-ray at 10 years; D) Range of movement at 10 years



**Figure 2.** Male, 46 years old, Surgery 2003, OA secondary to ankle fracture. Ramses II. TAR. 10-year follow-up, normal daily living, sports at lower intensity, Bicycle. Occasional pain. Partial functional limitation. A) Preoperative X-ray; B) Check X-ray; C) X-ray at 10 years, Partial talar collapse. Asymptomatic; D) Range of movement



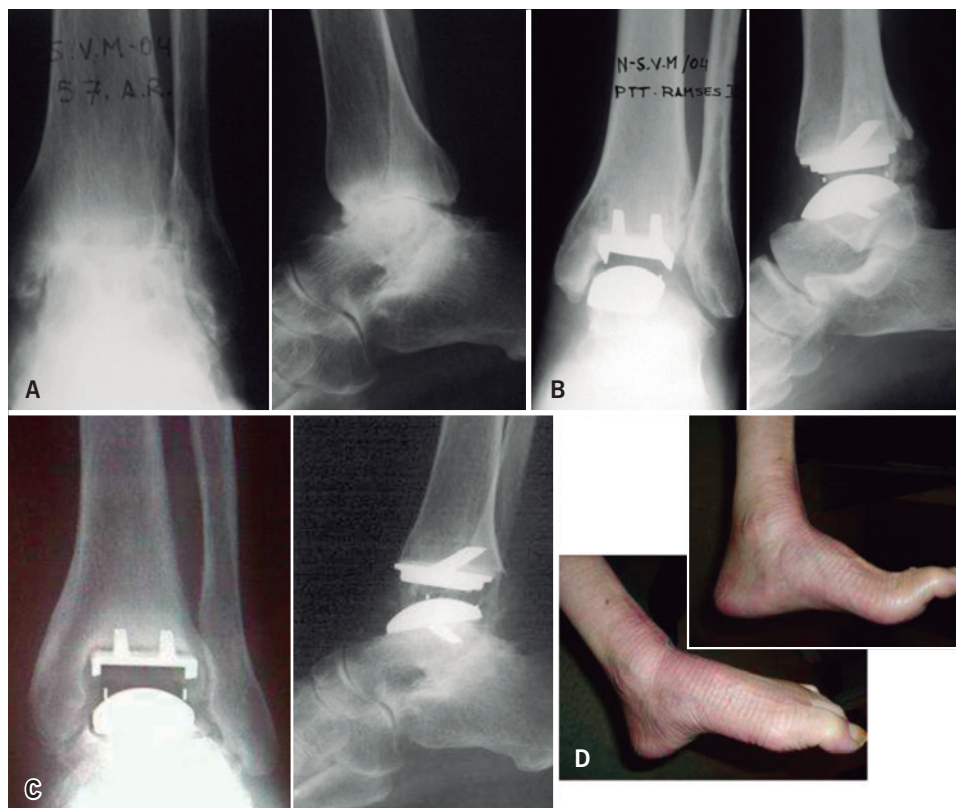
**Figure 3.** Male, 48 years old. Squeals of ankle fracture dislocation at 18 years of age Ramses II TAR in 2003. Last clinic 2003, at 10 years follow up, occasional pain. Normal daily living. Sports with limitations; A) Pre-op X-ray; B) Post-operative X-ray; C) X-ray at 10 years, peri-implant radiolucent images asymptomatic



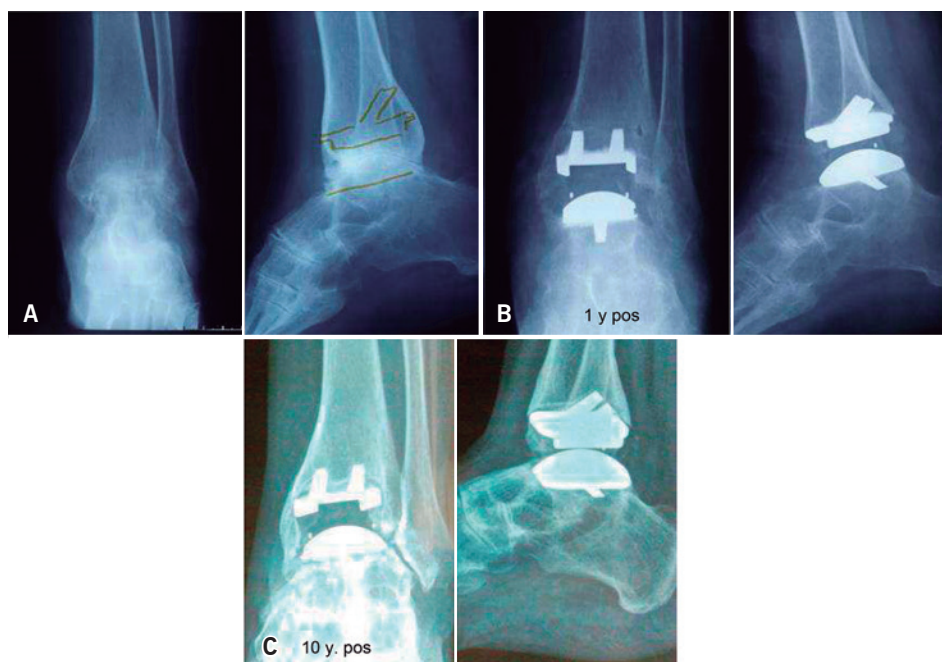
**Figure 4.** Male, 32 years old, ankle OA secondary to tibial fracture. Surgery 2001. Change of polyethylene liner and Achilles tendon lengthening at 1 year due to stiffness. Last control at 10 years in 2011. Normal daily living. Abandons climbing. Moderate functional limitation and pain; A) Preoperative X-ray; B) Post-operative X-ray; C) X-ray 2011 at 10 years. Metaphyseal widening and joint space narrowing are noticed



**Figure 5.** Female, 43 years old, primary OA. Ramses II TAR 2003. Stable; last control 2014 at 11 years follow up. Occasional pain. Active life style, no sports due to lack of drive; A) Preoperative X-ray; B) Post-operative X-ray; C) X-ray at 10 years. Collapse of both tibial and talar components. Moderate radiolucency 1mm



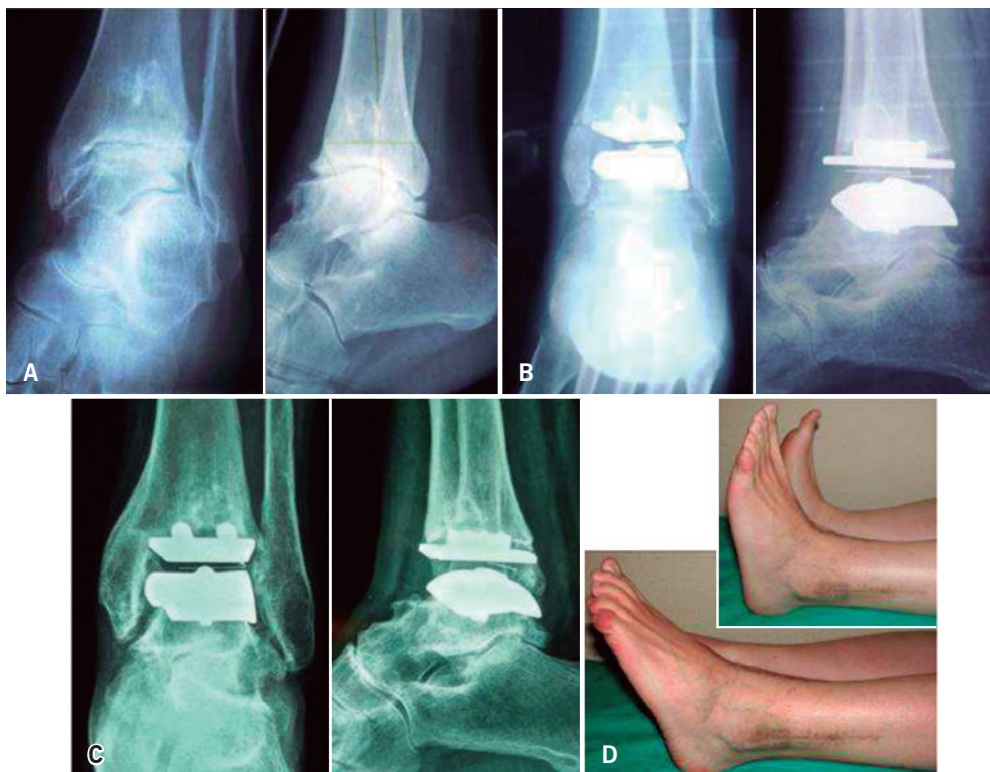
**Figure 6.** Male, 50 years old. Primary OA. Ramses II TAR. Stable, active life, no sports, occasional pain following long distance. A) Preoperative X-ray; B) postoperative X-ray; C) X-ray at 10 years. Radiolucent image under tibial component. Asymptomatic; D) Function



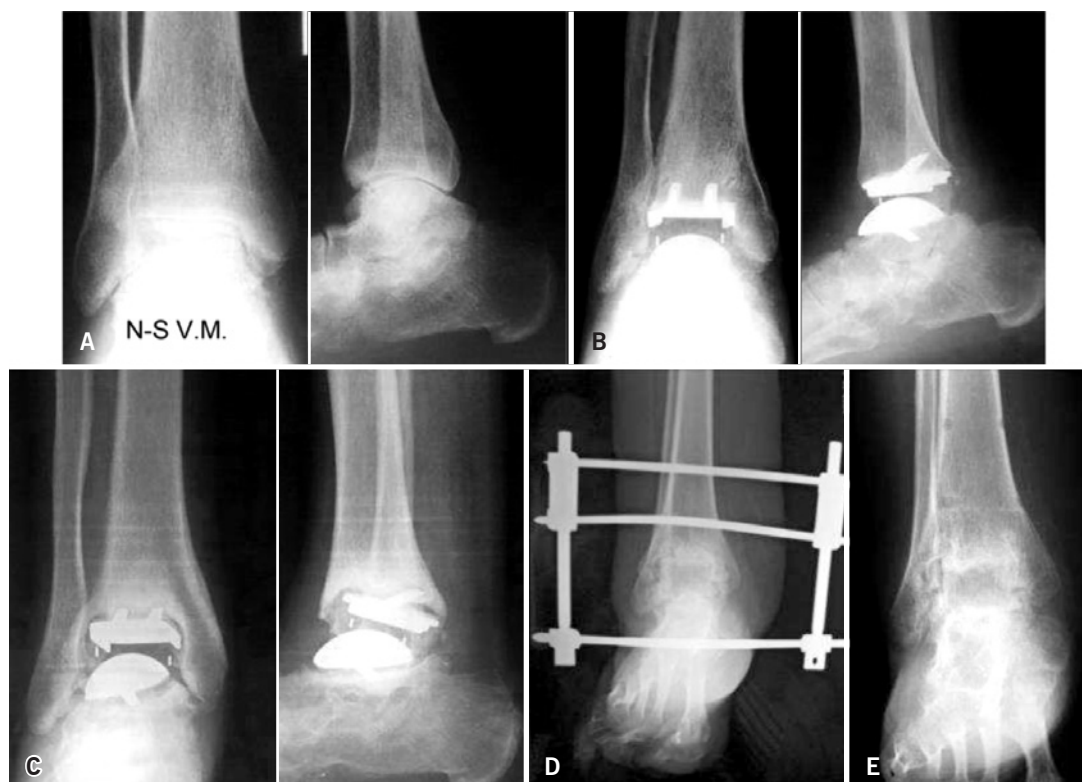
**Figure 7.** Female, 50 years old. Rheumatoid arthritis. Ramses II TAR 2005. 10 years post-operative follow-up. Normal life. Stable. Difficulty por walking secondary to Knee Arthroplasty with extension deficit. No pain. Optimum result as referred by the patient. A) Preoperative; B) Check X-ray at 1 year; C) X-ray at 10 years. Cystic images, due to RA, present on initial X-ray



**Figure 8.** Male, 49 years old, Secondary OA due to ankle fracture. 2005 Star TAR Asymptomatic with occasional pain. Normal life, light sports. A) Preoperative X-ray; B) Post-op check; C) X-ray at 10 years; D) Dorsal and plantar flexion (To see contralateral ankle)



**Figure 9.** Male, 38 years old. Sequelae of ankle fracture. 2005 Star TAR. Normal life. Occasional pain, light sports, ski. A) Preoperative X-ray; B) X-ray at 10 years follow-up; C) Dorsal and plantar flexion



**Figure 10.** Male, 49 years old, primary OA with subtalar anchilosis at 7 years follow-up. Ramses II TAR 2005. During 5 years moderate but tolerable pain. Significant prosthetic collapse in 2010. Ankle arthrodesis with allograft and external fixator. A) Preoperative X-ray; B) X-ray at 1 year; C) Component collapse at 5 years/ D) Ankle arthrodesis E) Check X-ray in 2015

results, but also the performance of the implant in terms of wear and personal comfort.

Preoperative AOFAS score ranged from 30 to 70 points, with a mean of 57,4, whilst post-operative AOFAS score at 10 years ranged from 25 to 83 points, with a mean of 72 points, showing an improvement of 15 points.

Range of movement found preoperatively (dorsal to plantar flexion) ranged from 20° to 30°, with a mean value of 50°. At ten years, it ranged between 45° and 55°, with a mean of 50°, showing an improvement of 25° (Table 2).

Three patients (30%) denied pain at 10 years, while 40% admitted to have suffered it occasionally. In 20% it was moderate and 10% of the patients endured severe pain. Patients suffering from occasional or moderate pain only needed regular pain relief (Ibuprofen) and admitted low impact on daily living activities. 90% returned to normal activity and 30% even sports, such as ski and tennis, although not performing at the same level as before surgery. One patient abandoned

**Table 2.** Initial valuation and final of the A.O.F.A.S. score, range of movement and outcome

Nº	AOFAS pre	AOFAS post	ROM pre	ROM post	Outcome
1	59	79	30°	55°	Satisfied
2	60	83	30°	55°	Satisfied
3	67	84	25°	45°	Satisf. moder
4	60	60	25°	50°	Unsatisfied
5	50	80	20°	45°	Satisfied
6	58	80	25°	60°	Very satisf
7	30	74	20°	60°	Satisfied
8	70	80	35°	60°	Satisfied
9	60	75	30°	60°	Satisfied
10	60	25	20°	45°	Unsatisfied

climbing, which originally was the cause for the presenting pathology.

A case (N.10) with primary OA, reported minor discomfort with march, although it was bearable. Radiographic control was satisfactory. He didn't come



back for follow-up until the fifth year, when the pain had increased. X ray film revealed implant failure and so arthrodesis was performed for rescue.

At the most recent X ray check, we have noticed radiolucent lines in 40% of cases, them being less than 2mm, mainly around the tibial component, reported by Kobayashi<sup>(15)</sup> as asymptomatic in 10% of cases and considered to be due to polyethylene debris. Case number 10 displayed an evident loss of bone stock due to implant hipermobility. A fibrous tissue interface was found intra-operatively.

Patient satisfaction at 10 years was very high in 10%, fair in 60%, moderate in 10% and 20% reported dissatisfaction. Patients who reported to be satisfied (80%) alleged an improvement in quality of life during these years and assumed the possibility of an ankle arthrodesis in the future (Table 1 and Table 2).

## COMPLICATIONS

Age has not been found to be a determining factor related to complications associated to this technique but with the surgical procedure itself. Related literature in older patients reports practically the same problems as those reported by Glazebrook.<sup>(16)</sup>

One case (10%) ended up in arthrodesis due to implant failure. Two cases presented a talar component partial collapse, both of them asymptomatic. Polyethylene spacer had to be revised in another patient along with an Achilles tendon lengthening. Three patients (30%) had minor wound healing problems although all of them evolved to complete healing within 15 days.

## DISCUSSION

Literature on total ankle replacement producing reliable data on indication and associated risks in patients less than 50 years of age is sparse.<sup>(17,18)</sup> The majority of papers, on the contrary, support arthrodesis and consider age as an important factor when planning surgery and indicating one or another technique.<sup>(19)</sup>

This series has allowed us to directly assess the implant performance over a 10 year period and modify indication in the future if necessary.

Final AOFAS score didn't reach 90 points in any case, and the maximum range of motion was 50°. 70% denied pain or reported tolerable one. Level of satisfaction was, in general 60%.

Failure rate was similar to that found in over 50 year-old patients.<sup>(20)</sup>

All authors in our bibliographic research have reported good results in younger patients.<sup>(4,6-8,11)</sup> They conclude that third generation TAR, regardless of the model implanted, in a safe technique in under 50 year-old patients that can yield good clinical and functional results at mid and long term, with a survival and complication rate comparable to those implanted in older patients.<sup>(11)</sup> Therefore, we consider that the indication criteria for total arthroplasty must be revisited.

## CONCLUSION

Our intention with this work has been to revisit the indication for total ankle replacement in patients of ages below 50 years as opposed to ankle arthrodesis which has traditionally been considered as gold standard.

In our series of ten cases with a 10 year follow-up, although not overly crowded, serves as a comparison with older age groups. In our results a 15 point improvement in AOFAS scale, as well as 25° in ROM have been found.

Also we have been able to assess the behaviour of the bone when exposed to cement versus that in uncemented models. In cemented prosthesis, we have found radiolucent lines around the components less than 2mm. width and asymptomatic, although a bigger collapse required of rescue arthrodesis.

Regardless of 20% of dissatisfied patients, 60% claimed a significant improvement in their quality of life and 20% where highly satisfied, and so we think that the indication for ankle replacement in patients below 50 needs to be revised, always weighting other alternatives which can delay this option.

## REFERENCES

1. Viladot Voegeli A. Indicaciones y contraindicaciones de las artroplastias de tobillo. Monografías de Actualización de la SEMCPT. Ed. Acción Médica. Arthrodesis vs Artroplastia de tobillo, N°. 6; 2014. p. 61-7.
2. Núñez-Samper M. Artroplastia modular de tobillo. Rev Ortop Traumatol. 2007;51(1):42-50
3. Hintermann B, Barg A., Knupp M, Valderrabano V. Conversion of painful ankle arthrodesis to total ankle arthroplasty. J Bone Joint Surg Am. 2009;91(4):850-8.
4. Valderrabano V, Hintermann B, Dick W. Scandinavian total ankle replacement: a 3.7 year average followup of 65 patients. Clin Orthop Relat Res. 2004;424:47-56.
5. Kitaoka HB, Patzer GL, Ilstrup DM, Wallrichs SL. Survivorship analysis of the Mayo total ankle arthroplasty. J Bone Joint Surg Am. 1994;76(7):974-9.

6. Kofoed H. Scandinavian Total Ankle Replacement (STAR). *Clin Orthop Relat Res.* 2004;424:73-9.
7. Spirt AA, Assal M, Hansen ST Jr. Complications and failure after total ankle arthroplasty. *J Bone Joint Surg Am.* 2004;86(6):1172-8.
8. Hintermann B, Valderrabano V, Dereymaeker G, Dick W. The HIntegra ankle: rationale and short-term results of 122 consecutive ankles. *Clin Orthop Relat Res.* 2004;424:57-68.
9. Kofoed H, Lundberg-Jensen A. Ankle arthroplasty in patients younger and older than 50 years: a prospective series with long-term follow-up. *Foot Ankle Int.* 2008;20(8):501-6.
10. Saltzman C, Mann R, Ahrens JE, Amendola A, Anderson RB, Berlet GC, et al. Prospective controlled trial of STAR total ankle replacement versus ankle fusion: initial results. *Foot Ankle Int.* 2009;30(7):579-96.
11. Rodríguez Pinto R, Muras J, Martín Oliva X, Amado P. Total ankle replacement in patients under the age of 50 years. Should the indications be revised? *Foot Ankle Surg.* 2013;19(4):229-33.
12. Núñez-Samper M. Prótesis total de tobillo Ramsés: indicaciones y técnica de implantación. *Rev Pie y Tobillo.* 2005;19(1):81-93.
13. Nuñez-Samper M, Lao Duran E, Souki F. Prótesis total de tobillo en el paciente joven. *Monografías de la SEMCPT, N° 7;2015.*
14. Álvarez Goenaga F. Artroplastia total de tobillo. Primeros 25 casos. *Rev Esp Cir Ortop Traumatol* 2008;52(4):224-32.
15. Kobayashi A, Minoda Y, Kadoya Y, Ohashi H, Takaoka K, Saltzman CL. Ankle arthroplasties generate wear particles similar to knee arthroplasties. *Clin Orthop Rel Res.* 2004;425:69-72.
16. SooHoo NF, Zingmond DS, Ko CY. Comparison of reoperation rates following ankle arthrodesis and total ankle arthroplasty. *J Bone Joint Surg Am.* 2007;89(10):2143-9.
17. Glazebrook MA, Arsenault K, Dubbar M. Evidence-based classification of complications in total ankle arthroplasty. *Foot and Ankle Int.* 2009;30(10):945-99.
18. Choi G, Kim HJ. Comparison of the HINTEGRA and mobility total ankle replacement. Short- to immediate term-outcomes. *Bone Joint Surg.* 2013;95-B(8):1075-82.
19. Kofoed H. Is ankle arthrodesis or total ankle replacement the better treatment? *Foot Ankle Surg.* 2014;20(1):1. doi: 10.1016/j.fas.2013.12.003.
20. Doets HC, Brand R, Nelissen RG. Total ankle arthroplasty in inflammatory joint disease with use of two mobile-bearing designs. *J Bone Joint Surg Am.* 2006;88(6):1272-84.