TOTAL ANKLE ARTHROPLASTY : TOMODENSITOMETRIC EVOLUTION OF THE PERIPROSTHETIC CYSTS AT OF 4-YEARS APART AND ASSESSMENT OF THE SURVIVAL CURVES AT 13-YEARS FOLLOW-UP

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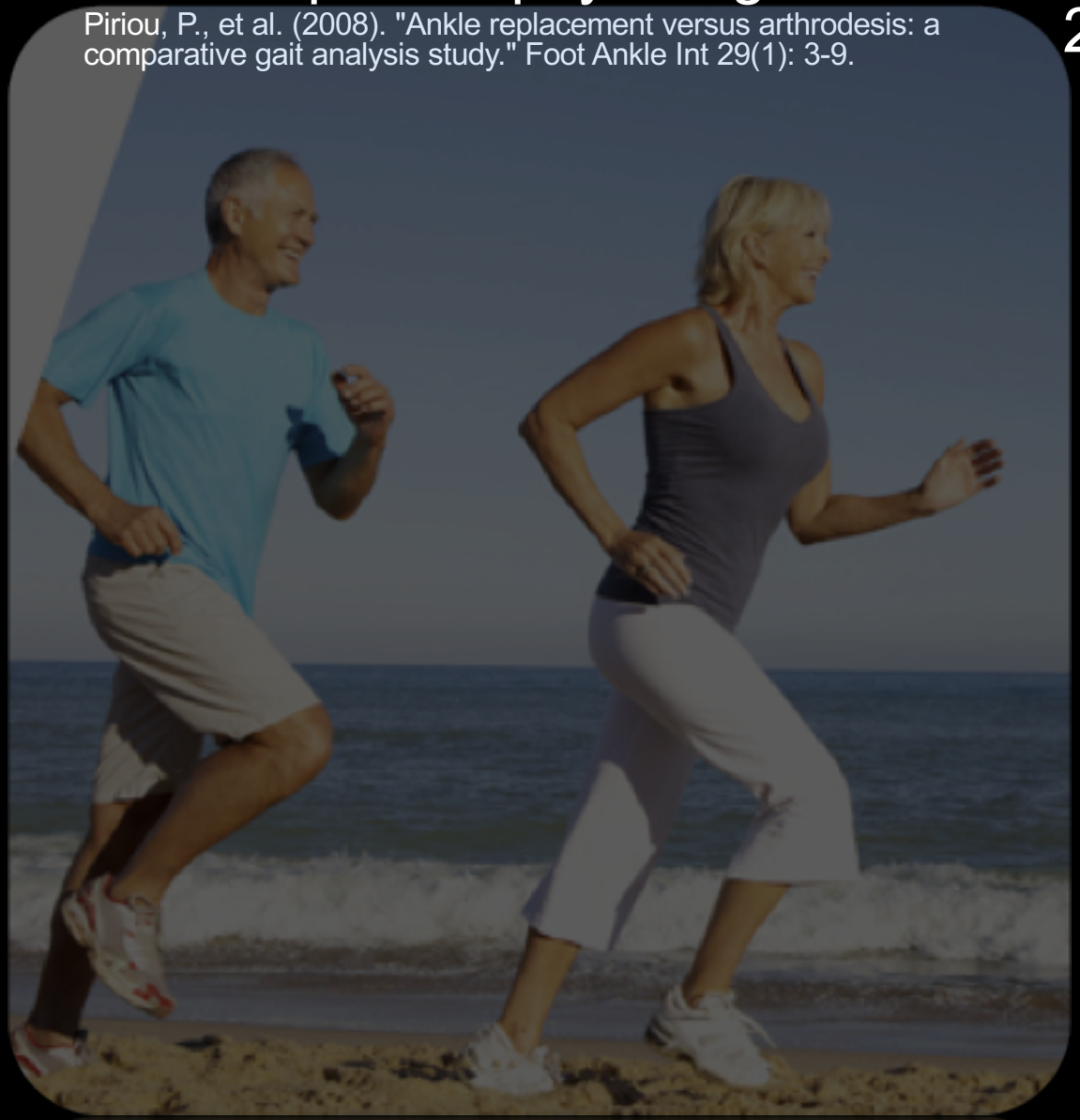
UNIVERSITÉ BORDEAUX SEGALEN

INTRODUCTION

TAR or Fusion ?

1. A step more physiological



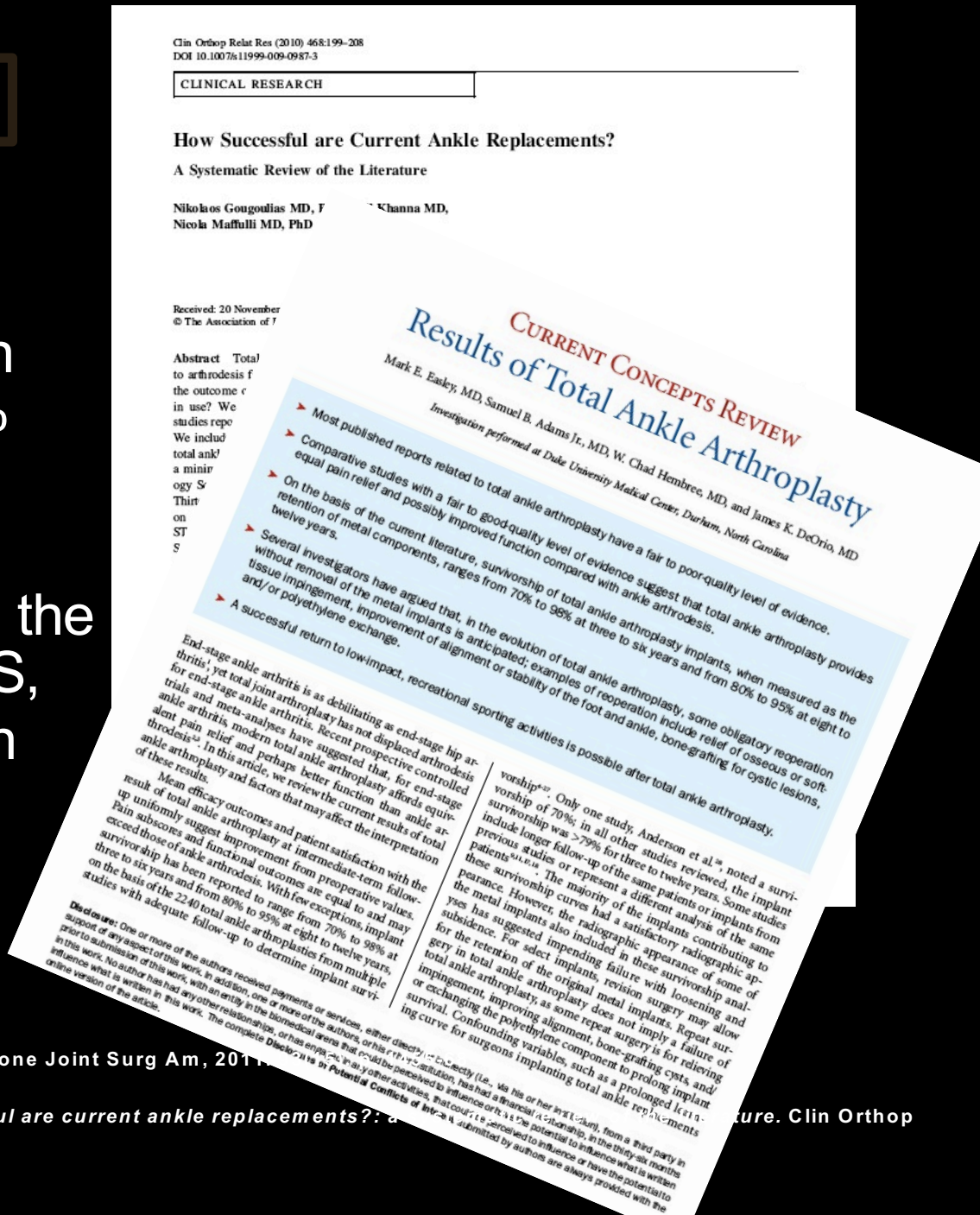
Piriou, P., et al. (2008). "Ankle replacement versus arthrodesis: a comparative gait analysis study." Foot Ankle Int 29(1): 3-9.

2. Protection of adjacent joints

3. Preservation of range of motion

Third Generation TAR

- 5-year survivorship, in situ TAR : 70% à 98%
- significant increase in the AOFAS score (AOFAS, Kofoed, Foot Function Index)



Clin Orthop Relat Res (2010) 468:199–208
DOI 10.1007/s11999-009-0987-3

CLINICAL RESEARCH

How Successful are Current Ankle Replacements?

A Systematic Review of the Literature

Nikolaos Gougoulias MD, A. Khanna MD, Nicola Maffulli MD, PhD

CURRENT CONCEPTS REVIEW

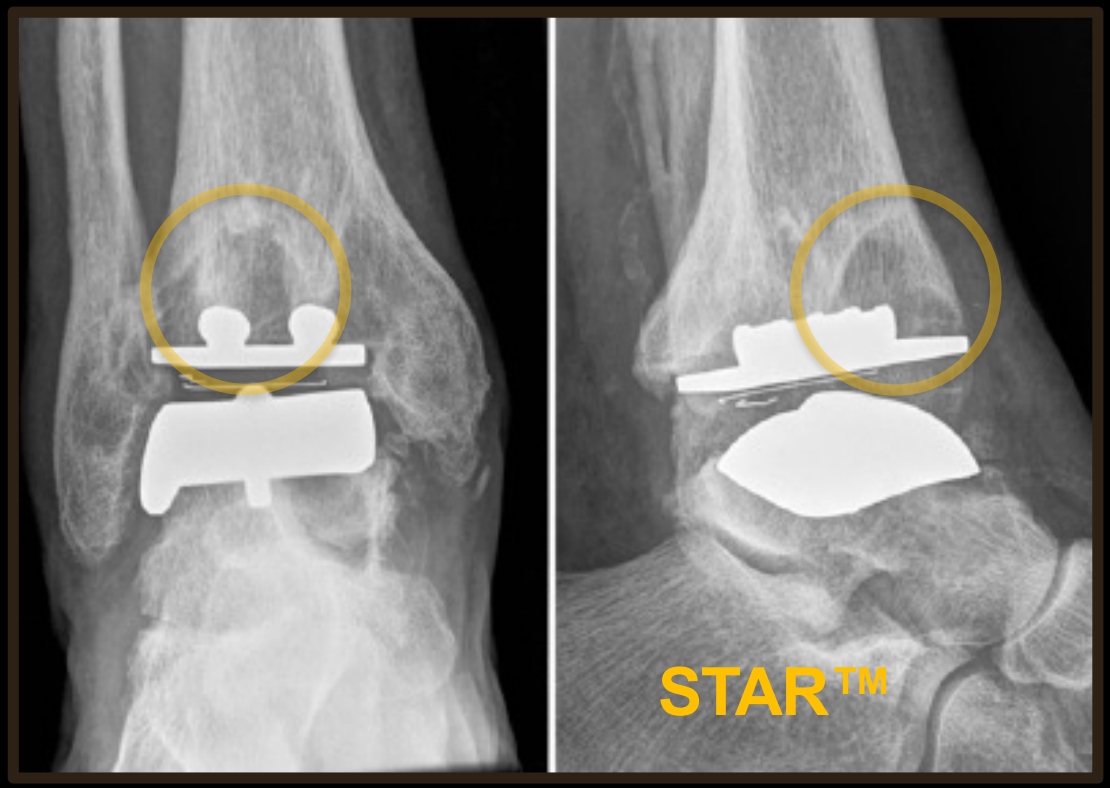
Results of Total Ankle Arthroplasty

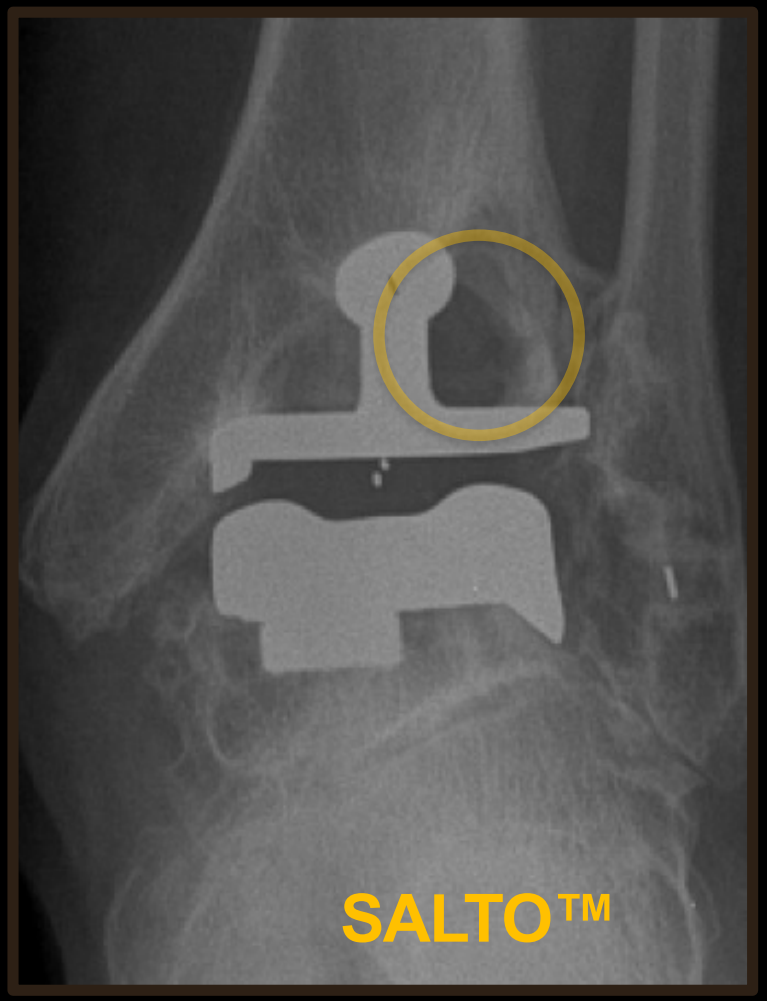
Mark E. Easley, MD, Samuel B. Adams Jr., MD, W. Chad Hembree, MD, and James K. DeOrio, MD

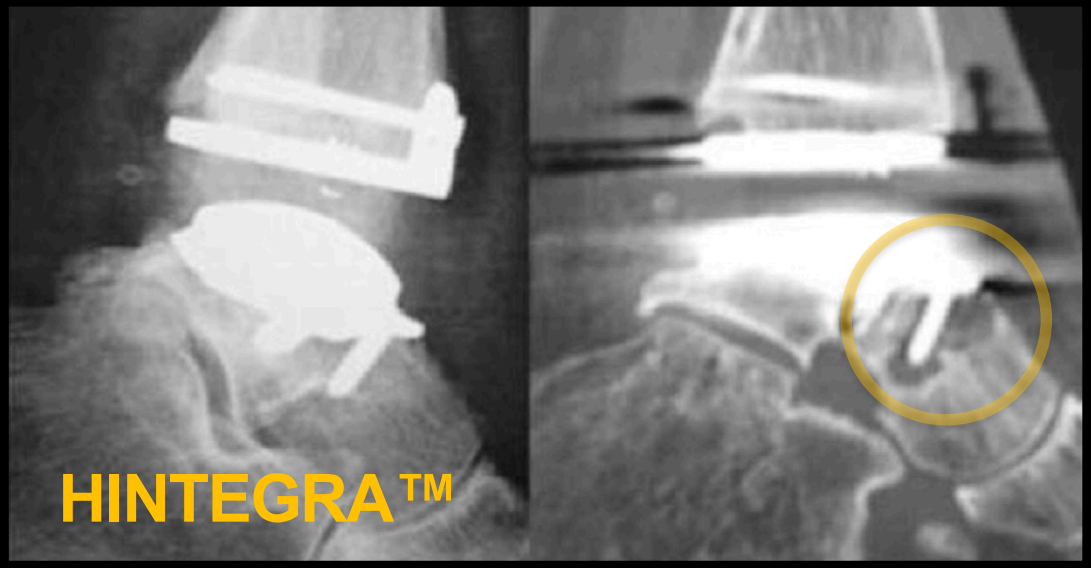
Investigation performed at Duke University Medical Center, Durham, North Carolina

Easley, M.E., et al., *Results of total ankle arthroplasty*. J Bone Joint Surg Am, 201

Gougoulias, N., A. Khanna, and N. Maffulli, *How successful are current ankle replacements?: a* *ture*. Clin Orthop Relat Res, 2010. 468(1): p. 199-208. .







SERIOUS CONCERN

Mid term large periprosthetic cysts in every TAR

Lucas, Y. H. J., et al. (2014). "AKILE total ankle arthroplasty: Clinical and CT scan analysis of periprosthetic cysts." Orthop Traumatol Surg Res.

Mean F-up : 6,7 years ± 3 months

- Functional results
- Survival curve
- Glazebrook complication classification

Survival at 5 years : 72,3%

68 patients

Orthopaedics & Traumatology: Surgery & Research 100 (2014) 907–915

Available online at ScienceDirect www.sciencedirect.com

Elsevier Masson France EM|consulte www.em-consulte.com/en

Original article

AKILE™ total ankle arthroplasty: Clinical and CT scan analysis of periprosthetic cysts

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2012

ABSTRACT

Introduction: Despite good clinical results following total ankle replacement (TAR), the development of large periprosthetic cysts (> 400 mm²) in the medium-term is a source of concern.
Objective: The primary objective of this study was to detect any large periprosthetic cysts in a cohort of AKILE™ patients using radiographs and CT scans, and then to compare these findings to published ones.
Material and methods: A total of 127 TAR procedures were performed between June 1995 and January 2012. We retrospectively reviewed 68 cases with the newest AKILE™ implant design that had a minimum follow-up of 36 months. The average follow-up was 81 ± 33 months; eight patients were lost to follow-up. The outcomes consisted of analyzing radiographs (A/P and lateral weight bearing views, Meary view and lateral views of flexion/extension) and helical CT scans, performing clinical evaluations (range of motion, AOFAS score, Foot Function Index, pain levels) and determining the survivorship of TAR implants.
Results: TAR survival at 5 years was 79% for in situ implants and 62% for revision-free implants. The AOFAS score improved from 33.7 ± 14.7 to 77.1 ± 15.1 (out of 100) and the pain sub-score was 30.2 ± 9.7 (out of 40) at the last follow-up. The average ankle range of motion was 32.3° ± 12.7° on the radiographs. CT scan revealed Type A cysts (< 200 mm²) under the talar implant in 52% of cases and in the tibia in 50% of cases; these cysts were smaller than 100 mm² in 80% of cases and had no effect on the implants. No periprosthetic cysts larger than 400 mm² in size were identified.
Discussion: The medium-term functional results and survivorship are comparable to those reported for other TAR designs. The incidence of cysts was low overall and there were no large-diameter cysts, which should improve long-term survival. The implant's design and materials likely played a role in preserving the periprosthetic bone stock. The AKILE™ TAR has distinctive features related to the low rate of large periprosthetic cysts in the medium-term.
Level of evidence: IV (retrospective case series).

1. Introduction

The functional benefits of mobile-bearing total ankle replacement (TAR) implants in the medium-term are significant [1,2]. But periprosthetic osteolysis and cysts in the medium and long-term are a source of concern and temper the excellent short-term results [3]. In some studies, the rate of radiolucent lines and cysts has reached 75%, with large cysts compromising implant stability [4–6]. The primary objective of the current study was to analyze the radiographic results in a cohort of existing AKILE™ TAR by looking for the presence of bone cysts and evaluating their size on CT scans. The secondary objective was to determine the clinical results and compare them to published results. Only patients who had undergone TAR with the newest AKILE™ implant design were reviewed.

2. Material and methods

2.1. Study design

This was a retrospective study of the AKILE™ TAR procedures performed by the surgeon designers (DC and OL, Bordeaux University Hospital) between June 1995 and January 2012. The inclusion criteria consisted of primary, post-traumatic or inflammatory ankle arthritis as graded by Morrey and Wiedemann [7], which had failed conservative treatment and had at least 10° range of motion with no equinus deformity. Exclusion criteria consisted of greater than 10°

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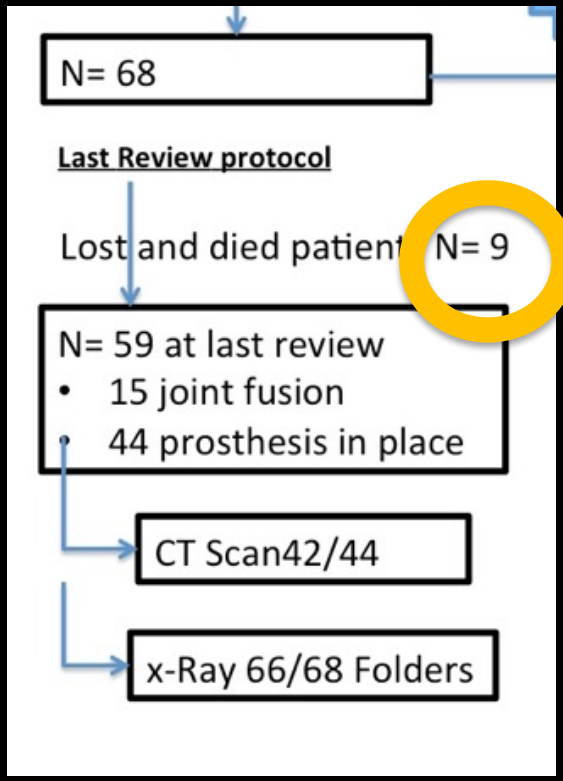
http://dx.doi.org/10.1016/j.otsr.2014.09.019
1877-0568/

Glazebrook MA, Arsenault K, Dunbar M. Evidence-based classification of complications in total ankle arthroplasty. Foot Ankle Int 2009;30:945-9.

2012 STUDY



=13,2%

- Schenk, K., et al. (201 spective study of a cementless ring, third generation to rosthesis." Foot Ankle Int 32(8): 763.

218/401

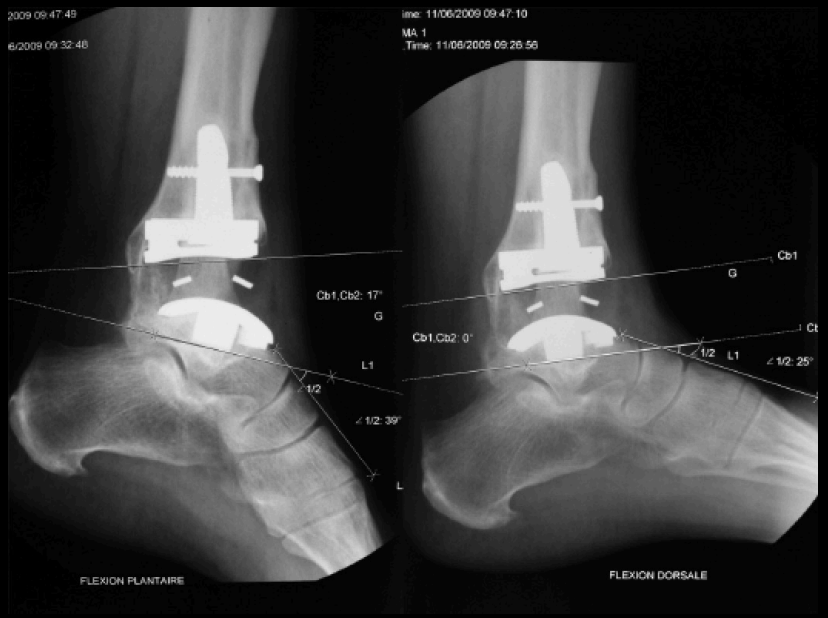
=54%

- Registre NZ 202 cas et 45 non déclarés

=22%

	Before	après
AOFAS	33,7	77,1

Mean F-up : 6,7 years ± 3 months



RADIOGRAPHS AND CT-SCAN ANALYSIS

Rodriguez protocol

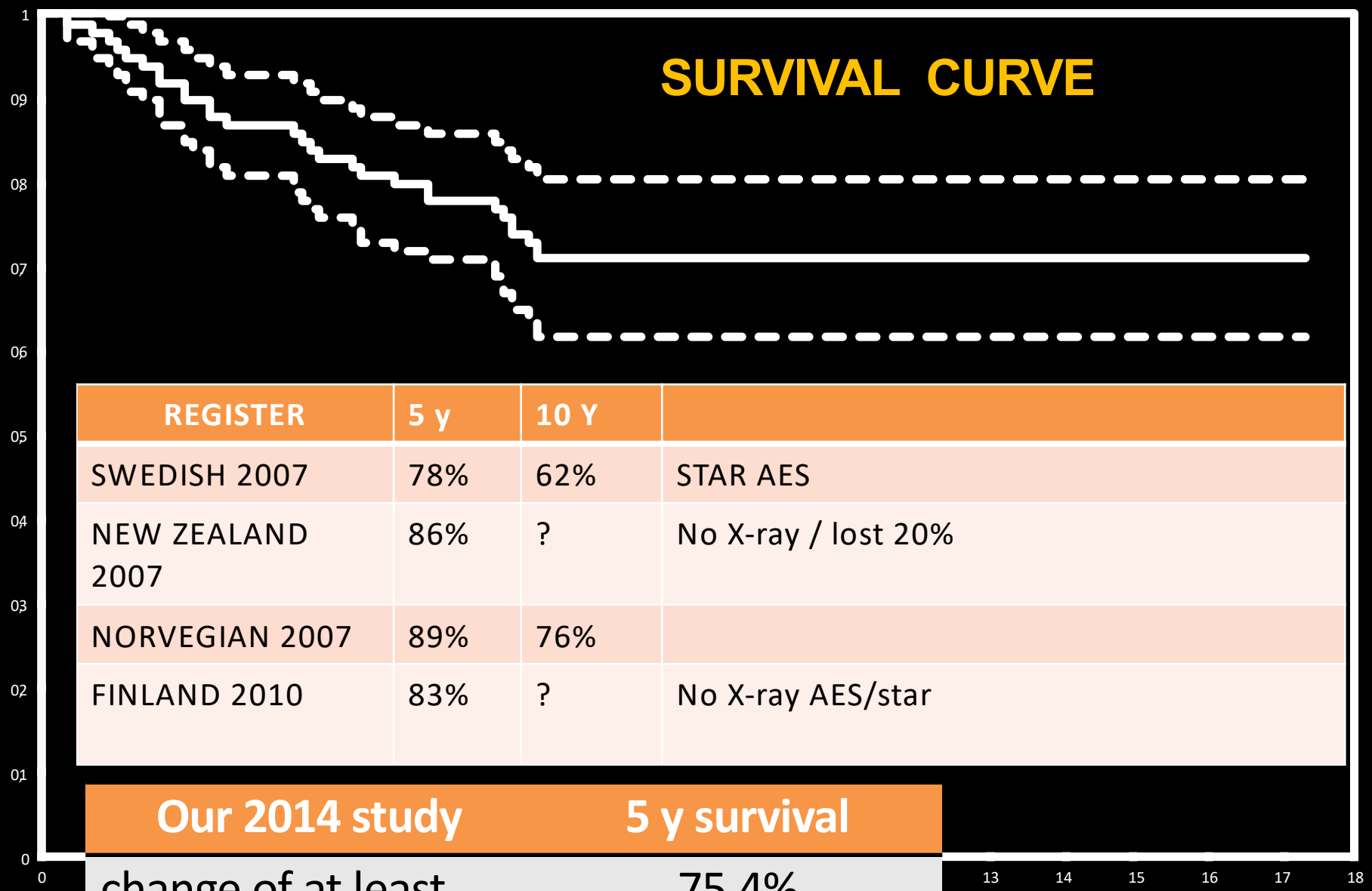
A (0-200 mm^2),
B (200-400 mm^2),
C (more than 400 mm^2)

Mean F-up : 6,7 years ± 3 months

93 % of cysts finded were Type A (<200 mm^2)

80 % of cysts A were lower than100 mm^2

Rodriguez, D., et al., *Medium term follow-up of the AES ankle prosthesis: High rate of asymptomatic osteolysis.* Foot Ankle Surg, 2010. 16(2): p. 54-60.



REGISTER	5 y	10 Y	
SWEDISH 2007	78%	62%	STAR AES
NEW ZEALAND 2007	86%	?	No X-ray / lost 20%
NORVEGIAN 2007	89%	76%	
FINLAND 2010	83%	?	No X-ray AES/star

Our 2014 study	5 y survival
change of at least one metal component	75,4%

MATERIALS & METHODS

2012 cohort : 68 patients / 42 Ct scan

59 ± 11 years

Mean F-up : 13 years ± 6 months

Classic F-up and new CT-scan

A (0-200 mm^2),
B (200-400 mm^2),
C (more than 400 mm^2)

- Carbioceram™ (DLC) stainless steel Implant
- bone-implant interface : alumina

- a dual-curvature PE insert and
- a spherical tibial component

RESULTS

Mean F-up : 6,7 years ± 3 months

Mean F-up : 13 years ± 6 months

clinical

		2012	2016	
AOFAS	33.6 ± 13.4	77.6 ± 15.4	75 ± 18.2	
R.O.M	23.1± 9.5	28.4 ° ± 10.8	21.6 ° ± 9.2	
5-year survival change of at least one metal component		75,4%	82.7%	2 fusion 1 talar revision

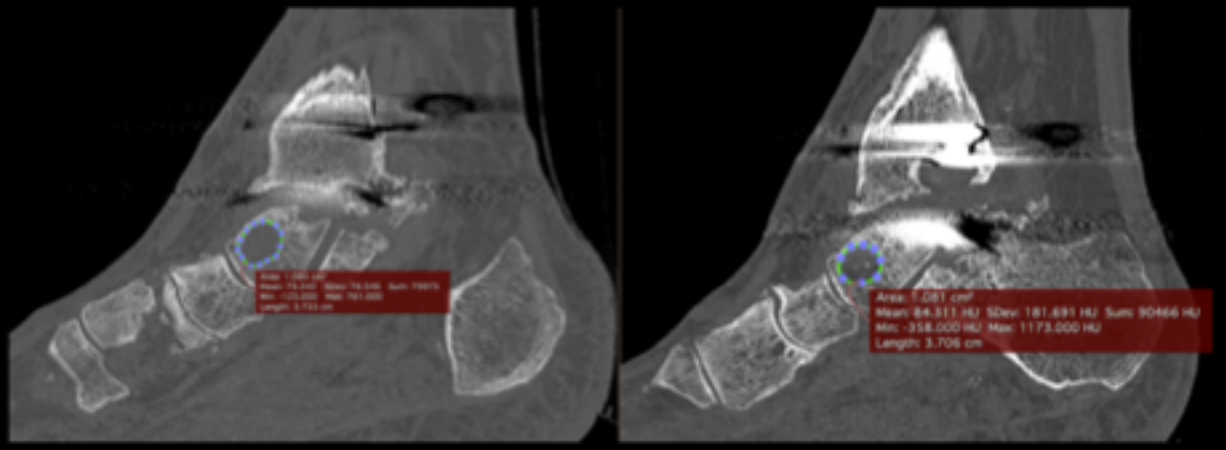
radiological

22% of all cysts increase in volume +47%

Cysts Type A (<200 mm^2)	**93 %**	**90.6%**
Type A less 100 mm^2	**80 %**	**80%**

DISCUSSION

CT scan analysis



Stability of the cysts in number

- Small caliber : type A
- Volume of type A decrease
- 22% of cysts increase slightly

phenomena of complex reworking of the subchondral bone

no preoperative CT

- over-estimation by osteoarhritis
- New protocol with preoperative scann

DISCUSSION

subtalar arthrodesis would allow a partial revascularization of the talus

No talar cyst was found in patients who underwent subtalar arthrodesis

Kodama N, Takemura Y, Shioji S, Imai S. Arthrodesis of the ankle using an anterior sliding tibial graft for osteoarthritis secondary to osteonecrosis of the talus: A comparison of vascularised non-vascularised grafts. *Bone Jt J.* 2016;98-B(3):359-364. doi:10.1302/0301-620X.98B3.36154.

DISCUSSION

Survival curve is a statistic curve and need F-up to be reliable

5-year survival

change of at least one metal component

Our study 82.7%
with a mean F-up = 13 years ± 6 months

				Year	Number	5y survival	10y survival
	STAR	Anderson	Sweden	2003	51	70,0	-
Mean F-up = 3.8 y	**STAR**	Wood	UK	2008	200	93,3	80,3
Mean F-up = 9.1 y	**STAR**	Mann	USA	2011	84	96,0	90,0
	STAR	Brunner	Switzerland	2013	77	-	70,7
Mean F-up = 6.3 y	**Hintegra**	Barg	Switzerland	2013	684	94,0	84,0
	STAR	Kerkhoff	Netherlands	2016	134	-	78

DISCUSSION

Survival curve is a statistic curve and need F-up to be reliable

5-year survival

change of at least one metal component

Our study 82.7%
with a mean F-up = 13 years ± 6 months

Lost of f-up ?

Lost of f-up ?

Mean F-up = 4 y

Lot of lost
Register incomplete
Median F-up = 2.3 y

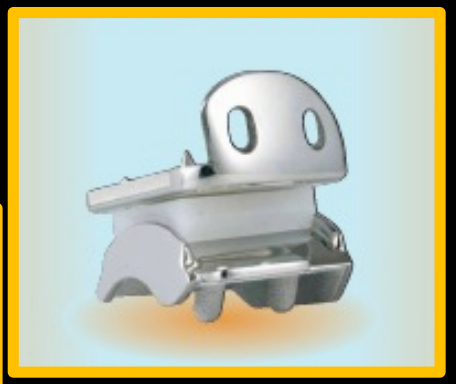
Methodological weaknesses
No clinical assessment
Mean F-up = 3.2 y

			Year	Number	5y survival	10y survival
STAR/AES/HINTEGRA MOBILITY	Henricson	Sweden	2007	531	78	62
NORWEGIAN TPR STAR/AES HINTEGRA	Fevang	Norway	2007	357	89	76
AGILITY/ RAMSES MOBILITY/STAR	Hosman	New zealand	2007	202	86	-
STAR/AES	Skyttä	Finland	2010	515	83	-

Third generation mobile bearing.

- Carbioceram™ (DLC) stainless steel Implant
- bone-implant interface : alumina
- a dual-curvature PE insert and
- a spherical tibial component

- Chrome Cobalt implant
- hydroxyapatite and porous titanium
- flat tibial component



HYPOTHESIS

Cysts development

- PE wear debris
- Chrome / cobalt particles
- Titanium particles

- design

- Tribology stainless steel / Carbioceram
  Friction coefficient

- bone-implant interface : alumina

CONCLUSION

Cysts are less frequent and smaller

Cysts stay stable 4 years apart

5-year survival 82.7%

ROM and AOFAS stable 4 years apart

- **Tribology ?**
- **Design ?**
- **Both ?**

STRENGH

Over time tomodensitometric study

F-up of 13y