Antwerp Orthopaedic Center
knee department

MoRe FOUNDATION

Val D'Isere 2014 update

Meniscus Allograft Transplantation and New Options

by Peter Verdonk, MD, PhD

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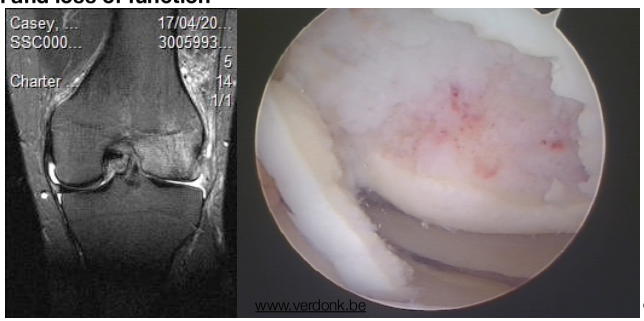
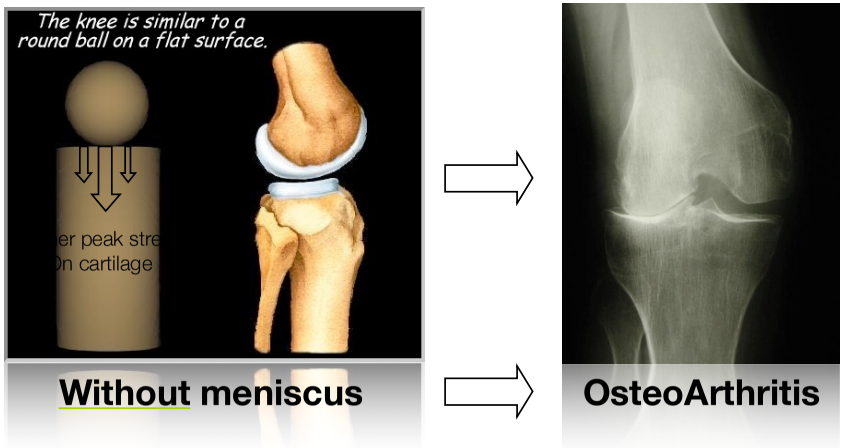
Outcome after meniscectomy?

Early Complications after meniscectomy...

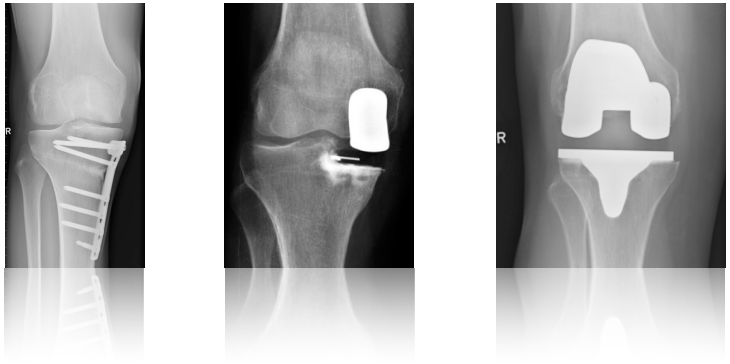
- **swelling** 28% *(Tabib, Beaufils. J. Traumatol. Sport, 1993)*
- **chondrolyse rapide** *(Charrois, Ayral, Beaufils Rev Chir Orthop Reparatrice Appar Mot. 1998)*
- **pain and loss of function**



Late Complications after meniscectomy...



Late Complications after meniscectomy...



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So what is the solution?...

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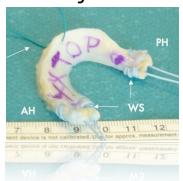
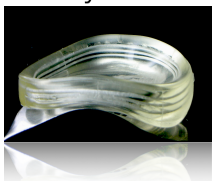
Meniscus Substitution Options in postmeniscectomy syndrome

20 years	5 years	2 year
		
meniscus allograft	meniscus scaffold	meniscus implant

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Meniscus Allograft Transplantation:

The Ultimate Survival Analysis

study performed by Peter Verdonk, Sofie Herregods, Arnoud De Kock, Jaap van der Maas, Thomas Tampere, and Rene Verdonk

www.verdonk.be

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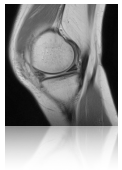

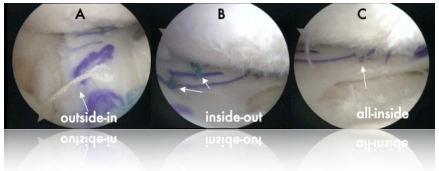

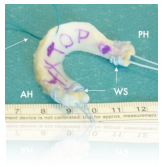

*Meniscus Allograft Transplantation for **large** meniscus defects*

successful surgery is all about indication

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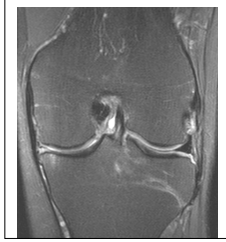
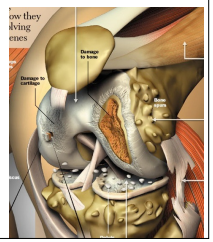
4 Indications

- ✓Subtotal Meniscectomy in Adults
- ✓ACL Revision + subtotal meniscectomy
- ✓Subtotal Meniscectomy in Youngsters
- ✓Subtotal Meniscectomy and early OA





Male 34, lateral meniscetomy and cartilage defect

...this illustrates that too often, the patient waits too long before he comes in for a MAT

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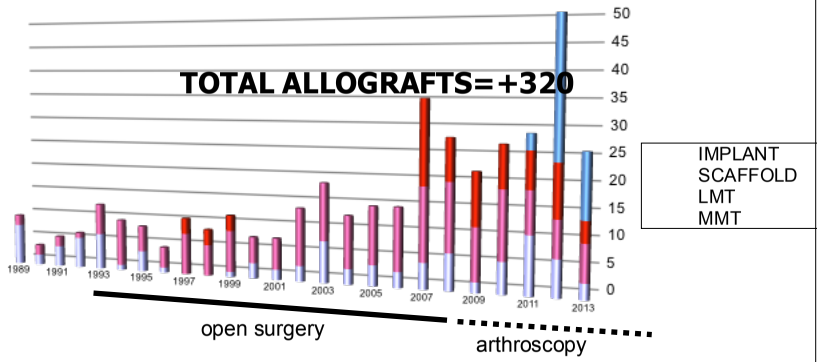
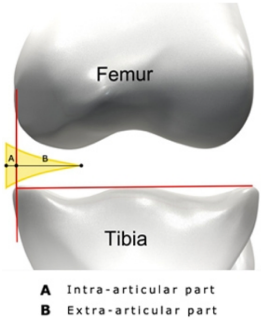
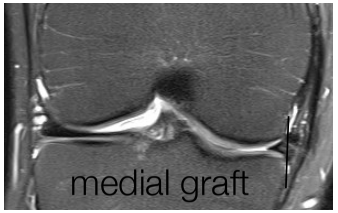
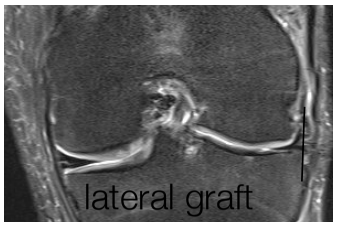
Our Experience



Extrusion measured on MRI: Bone Blocks or Not??







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Discussion

- Verdonk et al: ***Open surgery, no bone plugs, no transosseus fixation***
  - medial: 4,71mm / lateral 4,04mm
- Verdonk et al: ***Arthroscopy, no bone plugs, transosseus fixation***
  - medial: 2,36mm (<3mm: 85.7%, >3mm 14.4%)
  - lateral: 3,38mm (< 3mm: 28.5%, >3mm: 71.5%)
- Ha et al. AJSM 2010. ***Arthroscopy, bone blocks, medial and lateral***
  - Meniscal extrusion extent was ***3.87 ± 1.94 mm***. Seven cases (19.4%) showed minor extrusion (<3 mm), 27 (75%) showed major extrusion (>3 mm), and 2 (5.6%) showed no extrusion
- Lee et al. Arthroscopy 2008. ***Arthroscopy, bone blocks, medial and lateral***
  - The mean amount of graft subluxation on serial MRI was 2.87, 2.95, 3.03, and ***2.96 mm*** at 6 weeks, 3 months, 6 months, and 12 months after MAT, respectively.

additional value of bone blocks?

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Study Setup

- *Kaplan Meier Survival analysis*
  - Endpoint: Knee Arthroplasty
- *Multivariate analysis Cox's proportional hazard model*
  - left/right
  - male/female
  - medial/lateral
  - age
  - cartilage degeneration + microfracture
  - ~~lower limb alignment~~

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- **Meniscus Transplantation N=319**
  - International patients N=51
- **Belgian Patients N=268**
  - lost to follow-up N=50
  - missing values N=1
- **Included patients N=217**
  - censored cases before earliest event in stratum N=13
- **Cases available in cox analysis N=204**

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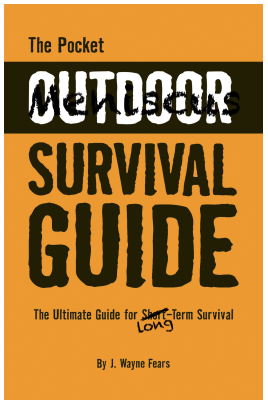
Survival Study Setup

- mean age 33.83 +/- 8.5 (range 16 -55 years).
- 123 men and 94 woman
- lateral/medial: 126/91
- mean FU: 8,2 +/- 6,2 years (range: 0 to 23 years)



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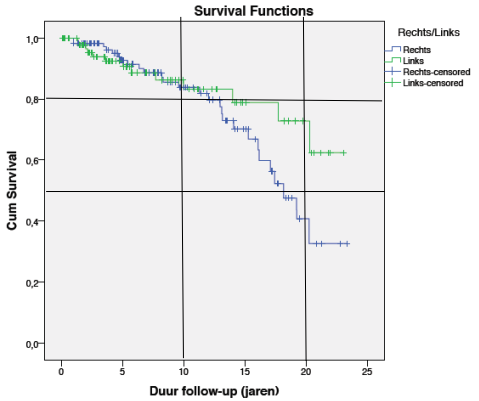
Right/left



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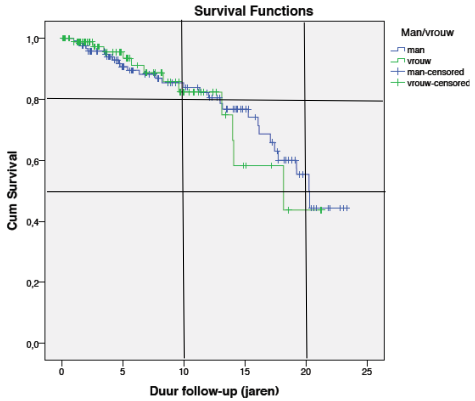
Male/female



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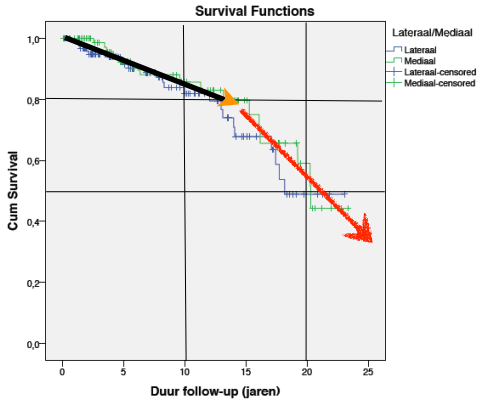
Lateral/medial



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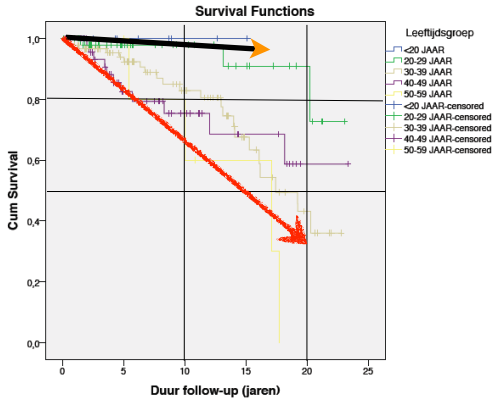
Age



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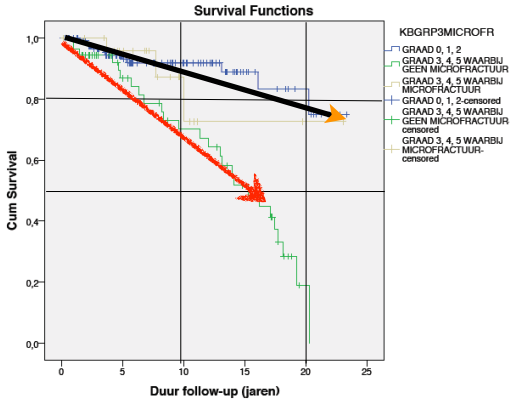
Cartilage degeneration



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Conclusions

- no difference between medials and laterals
- males have slightly higher risk than females
- older patients have higher risk for failure (risk increases 5.7% per year)
- cartilage degeneration increase risk for failure, however cartilage treatment (microfracture) reduces that risk!

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Conclusion

Meniscus Allograft Transplantation should no longer be considered experimental

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Conclusion

MAT is a bridging procedure towards knee arthroplasty for many patients

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Conclusion

MAT works best in young patients with limited cartilage wear!

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Conclusion

Focal cartilage defects are best treated in conjunction with MAT

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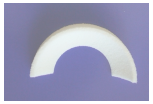

Poly-urethane scaffold for the treatment of** medial **and** lateral **partial meniscus defects

by Peter Verdonk, MD, PhD; Laurent Willemot, MD; Tineke De Coninck, MD; Aad Dhollander, MD, PhD and Rene Verdonk, MD, PhD

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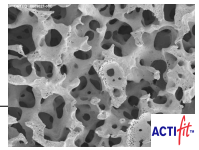
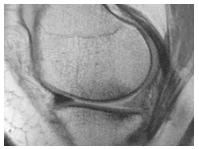
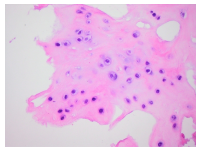
Polyurethane scaffold

- Safety and Feasibility trial finished in Europe
- CE mark since 2008
- slowly degradable scaffold
- implantable and biocompatible
- supports new meniscus-like tissue ingrowth and regeneration
- easy to use







Verdonk AAOS, ICRS, ESSKA
Verdonk et al. AJSM 2011 Tissue Ingrowth
Verdonk et al. AJSM 2012 Clinical outcome at 2 years

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The American Journal of Sports Medicine

Tissue Ingrowth After Implantation of a Novel, Biodegradable Polyurethane Scaffold for Treatment of Partial Meniscal Lesions

René Verdonk,*† MD, PhD, Peter Verdonk,† MD, PhD, Wouter Huysse,‡ MD, Ramses Forsyth,§ MD, PhD, and Eva-Lisa Heinrichs,‖ MD
Investigation performed at Ghent University Hospital, Ghent, Belgium

Successful Treatment of Painful Irreparable Partial Meniscal Defects With a Polyurethane Scaffold

— Two-Year Safety and Clinical Outcomes

Peter Verdonk,*† MD, PhD, Philippe Beaufils,‡ MD, Johan Bellemans,§ MD, PhD, Patrick Djian,‖ MD, Eva-Lisa Heinrichs,¶ MD, PhD, Wouter Huysse,# MD, Heinz Laprell,** MD, Rainer Siebold,†† MD, PhD, and Rene' Verdonk,‡‡ MD, PhD

A 24-Month Follow-up Study on Clinical and Radiological Outcomes of Polyurethane Meniscal Scaffolds

by Tineke De Coninck, Laurent Willemot, Rene Verdonk and Peter Verdonk
accepted for publication

ACTIfit™

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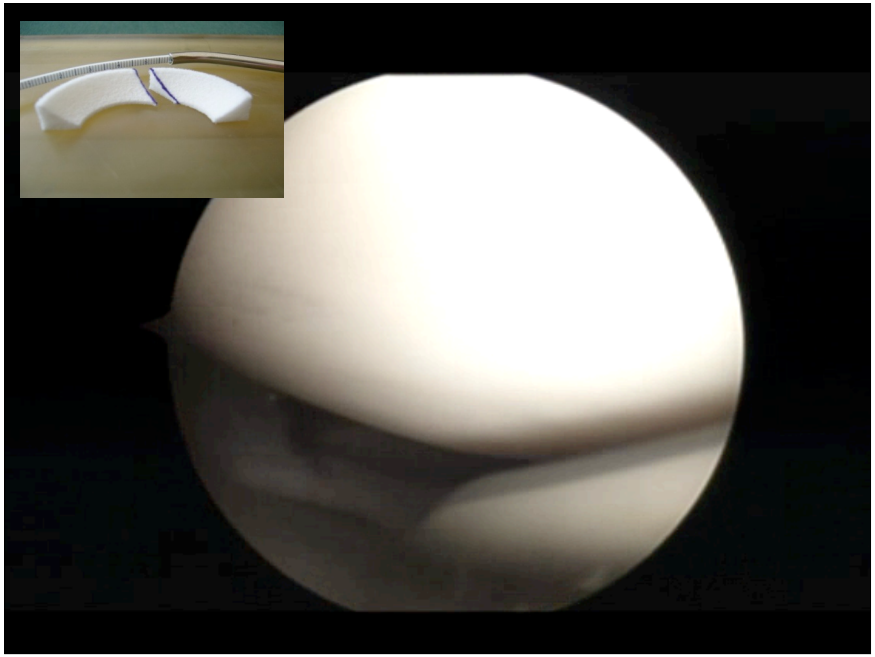

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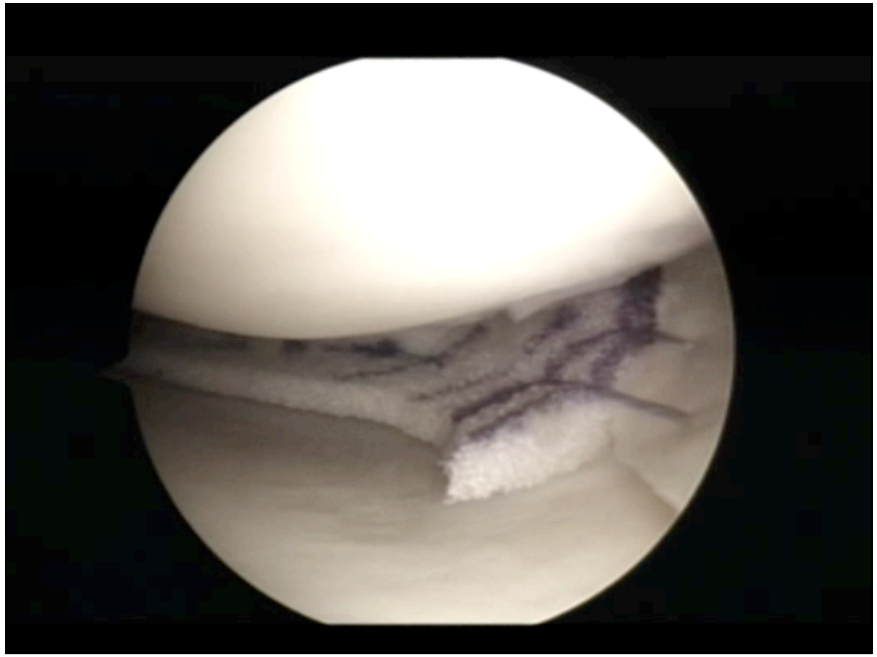

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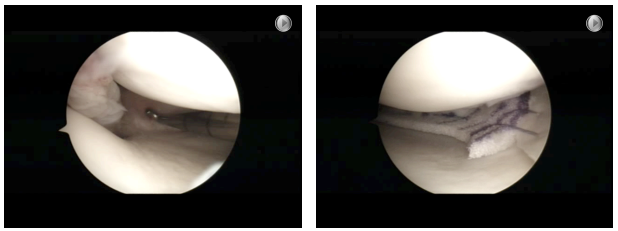
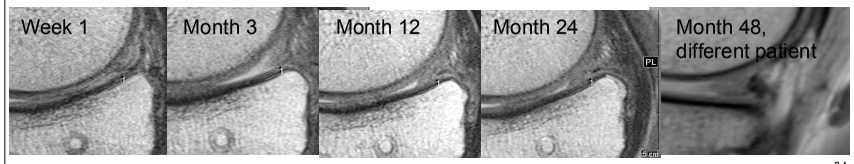
Typical Indication

- Remaining pain after extensive partial meniscectomy (3-7cm)
- Meniscus rim and horns intact
- Cartilage in good shape (max ICRS grade 3)
- Stable and well-aligned knee
- Typically younger patient with good healing potential

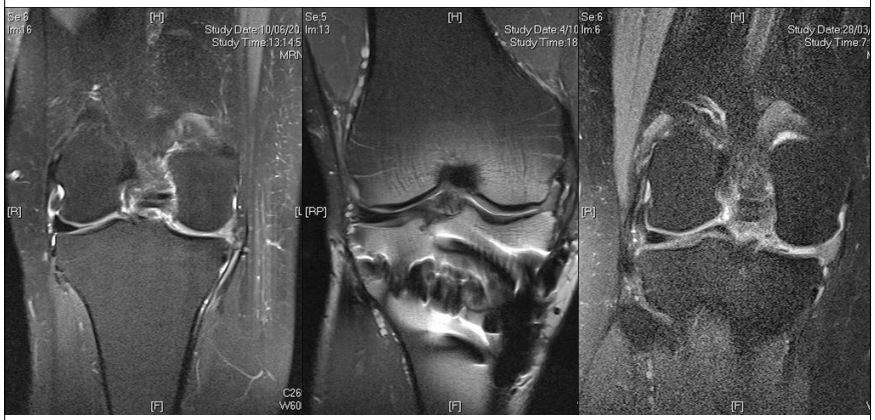


Imaging results: Meniscus

- Scaffold is clearly visible at week 1, 3 months, 12 months, 24 months and 48 months
- At week 1, all scaffolds were well-positioned illustrating reproducible surgical technique
- Signal intensity different from normal meniscus tissue



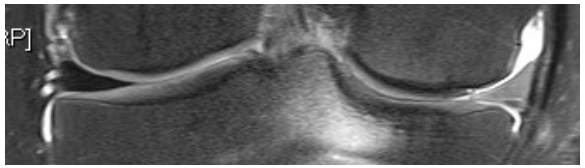
Imaging results: Meniscus

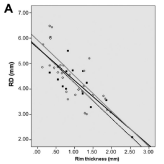


all 4+ years!

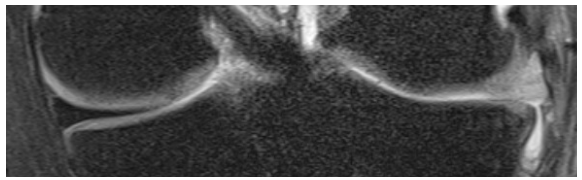
Imaging results: ***Radial displacement***

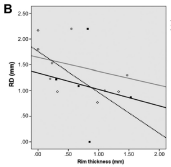
- ***Medial RD correlates with rim thickness...the thicker the rim, the less RD!***





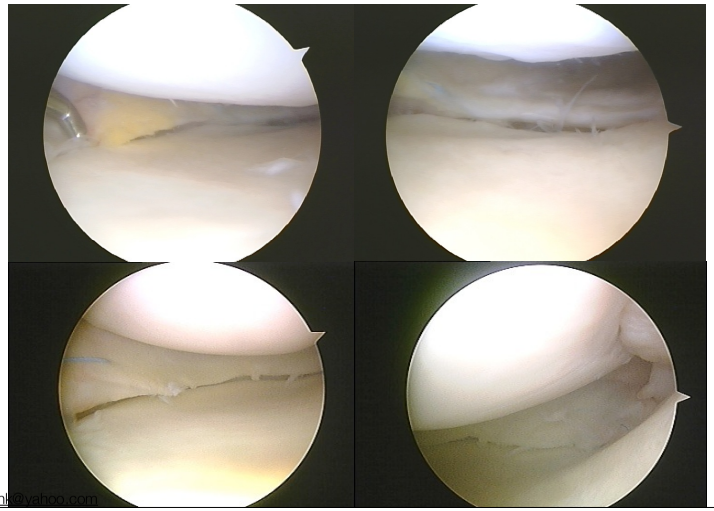
- **Lateral** RD does not correlate with rim thickness, RD exists already preop!!!!





- **RD does NOT correlate with clinical outcome!**

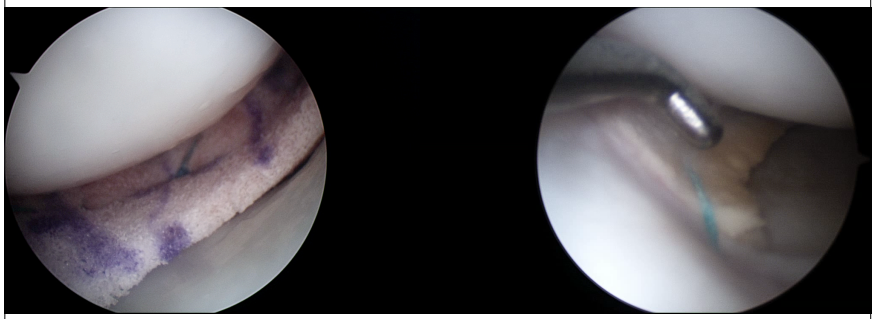
Original Study Relooks



Bone Marrow Cells

- easily accessible, cheap

Clinical application

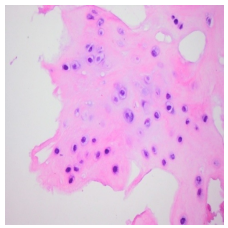


BM application on polyurethane scaffold

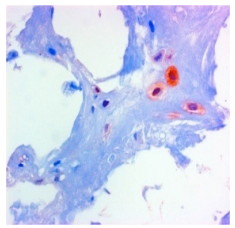
Relook at 12 months

Histology results

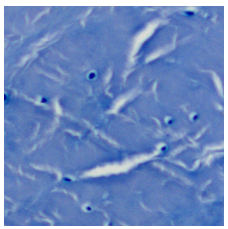
- **Predictable cellular organization**
- **Repopulation** of all biopsies with vital cells – no case of tissue necrosis or cell death - illustrating the biocompatibility of the Actifit™ scaffold
- **New tissue consistent** with ongoing process of regeneration, maturation and remodeling towards tissue with meniscus tissue characteristics. Scaffold material is still present at 12 months and becoming more translucent at 24 months



Chondroblast-like cells



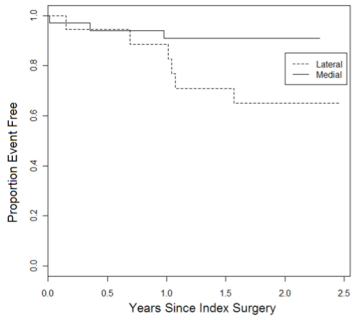
S-100 positive chondroblast-like cells



Normal native meniscus

The American Journal of Sports Medicine

Survival Analysis
Multicenter STUDY DESIGN



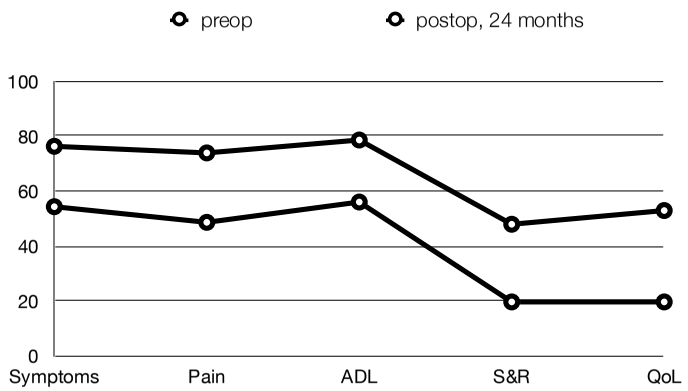
failures medial 3/32
failures lateral 6/18

Figure 1. Time to treatment failure by meniscal defect.

overall failure rate 17.3% at 2 years, all but 1 in the first 12 months

A treatment failure was deemed to have occurred if there was an additional surgical procedure on the index defect and if the surgeon decided that the need for such an additional procedure was of unknown, possible, probable or definite relationship to the scaffold and/or the index procedure. A total of nine (17.3%) [illegible] eight during the first year or at the protocol stipulated relook surgery and only one in the second year of the study (Figure 1).

KOOS Profile



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Conclusions

- Poly-urethane scaffold (ACTIfit) is biocompatible
  - No cell death or necrosis
  - No adverse reaction to scaffold material
- Regeneration of meniscus-like tissue is possible using an acellular device
- Significant improvement in pain and function at 12, 24 and 48 months
- No cartilage damage caused by the device
- Technical and indication learning curve with acceptable failure rates (17.3%)

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knee department

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Total Meniscus Implant for the treatment of large *medial* ***meniscus defects***

by Peter Verdonk, MD, PhD; Laurent Willemot, MD; Tineke De Coninck, MD; Aad Dhollander, MD, PhD and Rene Verdonk, MD, PhD

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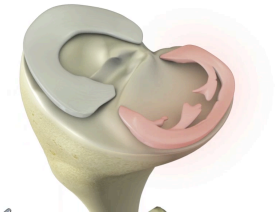
Typical Indication

- Remaining pain after subtotal medial meniscectomy
- Meniscus rim and horns intact
- Cartilage in good shape (max ICRS grade 3)
- Stable and well-aligned knee
- typically older patient beyond 'biological treatment' age… (45 years and up)



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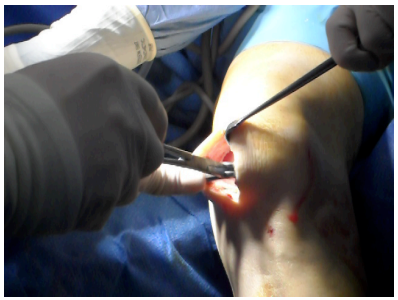
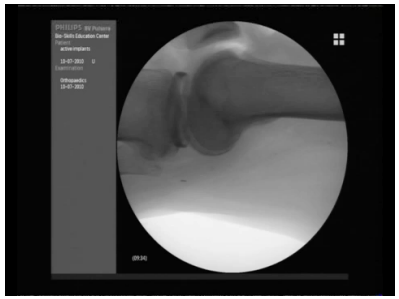
- treated patients in multicenter trial: 120
- personal series: 39





....still under clinical investigation

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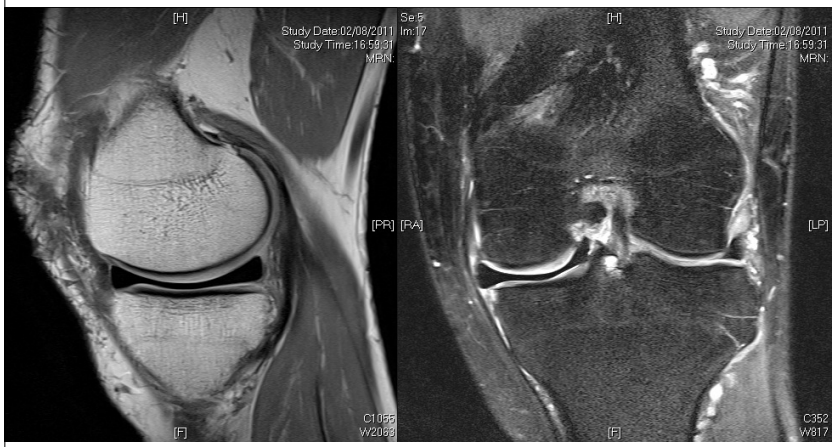

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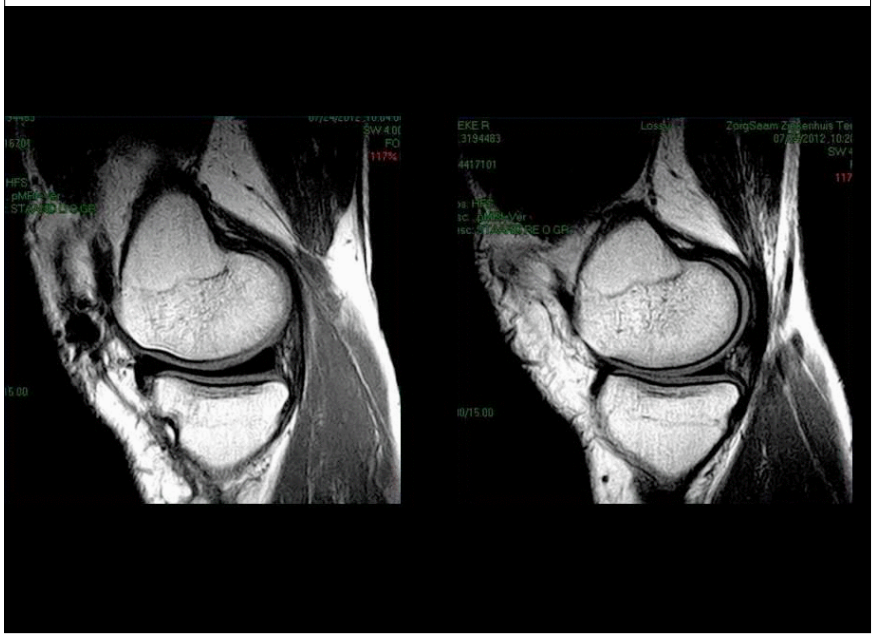

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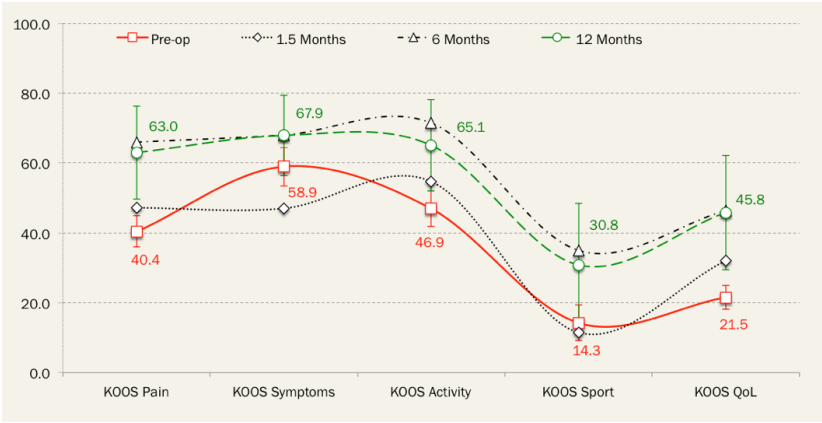
KNEE OSTEOARTHRITIS OUTCOME SCORE



clinical experience (Prof Peter Verdonk, MD PhD)

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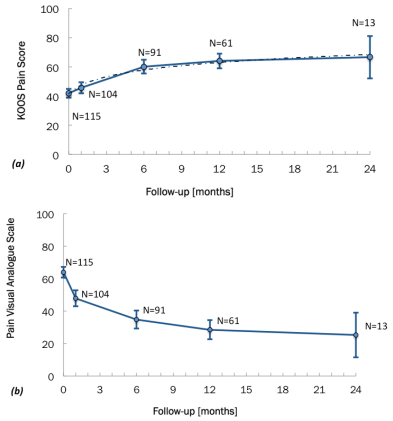
CLINICAL OUTCOME OVERALL



clinical experience (Prof Peter Verdonk, MD PhD)

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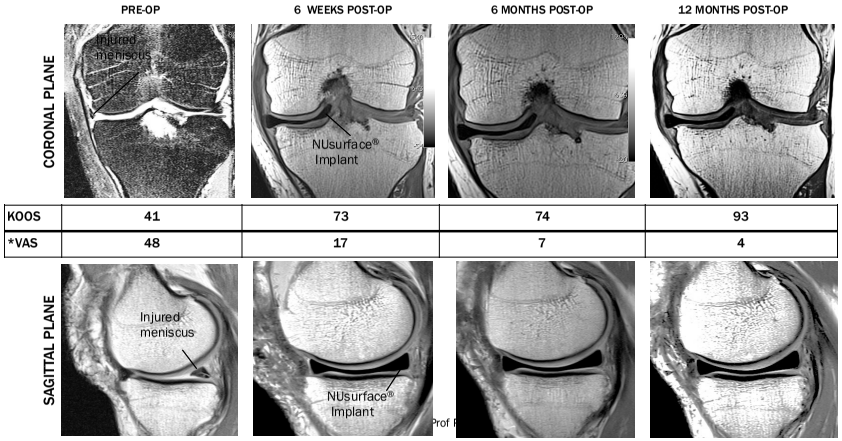
CASE REPORT: 1ST PATIENT TREATED

Male, 58 yrs. old, BMI=29, Pre-op: pain during long walks & climbing stairs;
In 2008, presented with unstable tear and partial meniscectomy. Returned to work as plant foreman



KOOS	41	73	74	93
*VAS	48	17	7	4

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CONCLUSIONS

- Early term clinical results are showing that:
  - the device allows patients to improve in results over time,
  - patients are reporting return to active lifestyle
- Critical device features:
  - Selection of optimal device size for each patient
  - Mandatory presence of a functioning posterior root
  - All failures occurred in the first 11 patients
    - All patients were re-implanted and are satisfied (to date) with their results
- Patients level of activity:
  - They should be reminded that they have an implant and should limit high impact activities
- The NUsurface® meniscus implant acts like a synthetic allograft without any of the disadvantages of cost, supply or sizing

clinical experience (Prof Peter Verdonk, MD PhD)

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Closing remarks

When you are confronted with a painful meniscectomy, consider meniscus replacement instead of a redo meniscectomy...

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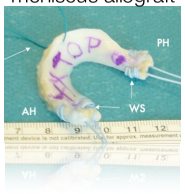
Take home message

prevent cartilage degeneration...
SAVE THE MENISCUS !!!

- meniscus solutions are expanding

meniscus allograft



meniscus scaffold

meniscus implant

Antwerp Orthopaedic Center
knee department

MoRe FOUNDATION

Thank you for your attention

by Peter Verdonk, MD, PhD

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