

Σιδερίδης Αριστοτέλης

Ορθοπαιδικός Χειρουργός



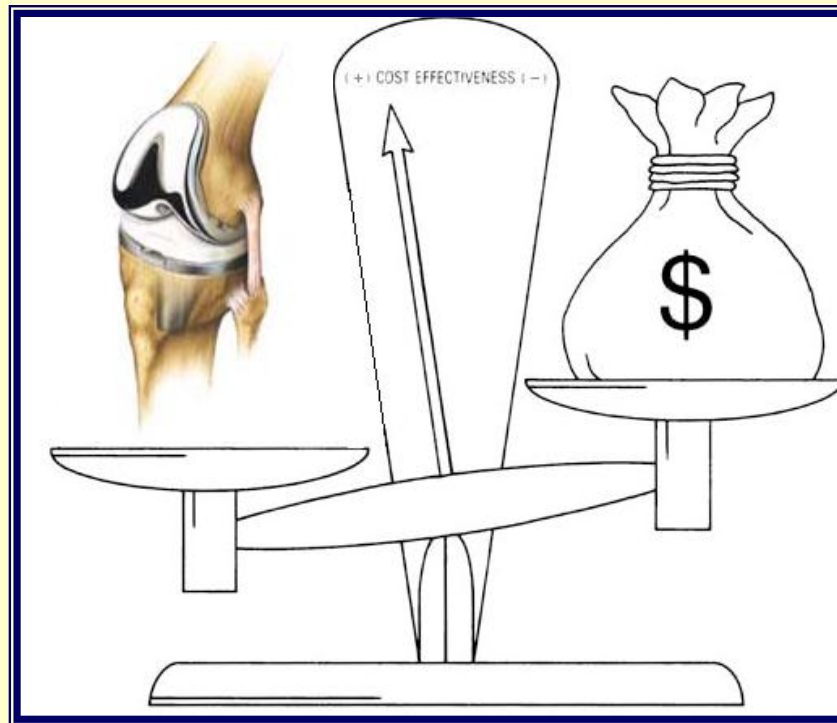
ΝΟΣΟΚΟΜΕΙΟ
ΑΓΙΟΣ ΛΟΥΚΑΣ
ΘΕΣΣΑΛΟΝΙΚΗ



Disclosures

- Lecture fees: Amgen, GSK, Rotafarm
- Research grant: -
- Consultancy Agreement: -

Χειρουργική αποκατάσταση οστεοαρθρίτιδας: δεδομένα κόστους αποτελέσματος



Οστεοαρθρίτιδα

Η Οστεοαρθρίτιδα
είναι χρόνια εκφυλιστική
εξελικτική ετερογενής ομάδα νοσηρών
σκελετικών καταστάσεων που προκαλούν
σημεία και συμπτώματα από τις αρθρώσεις και
σχετίζονται με βλάβη και καταστροφή του
αρθρικού χόνδρου και του υποχόνδριου οστού

ACR: Altman 1986



ΣΥΧΝΟΤΗΤΑ

- **Ακτινολογικό εύρημα οστεοαρθρίτιδας σε 30% των ανθρώπων άνω των 65 ετών και 80% άνω των 75 ετών !**
- **2^η αιτία στις Η.Π.Α., μετά τις καρδιαγγειακές παθήσεις, απώλειας εργάσιμων ωρών.**

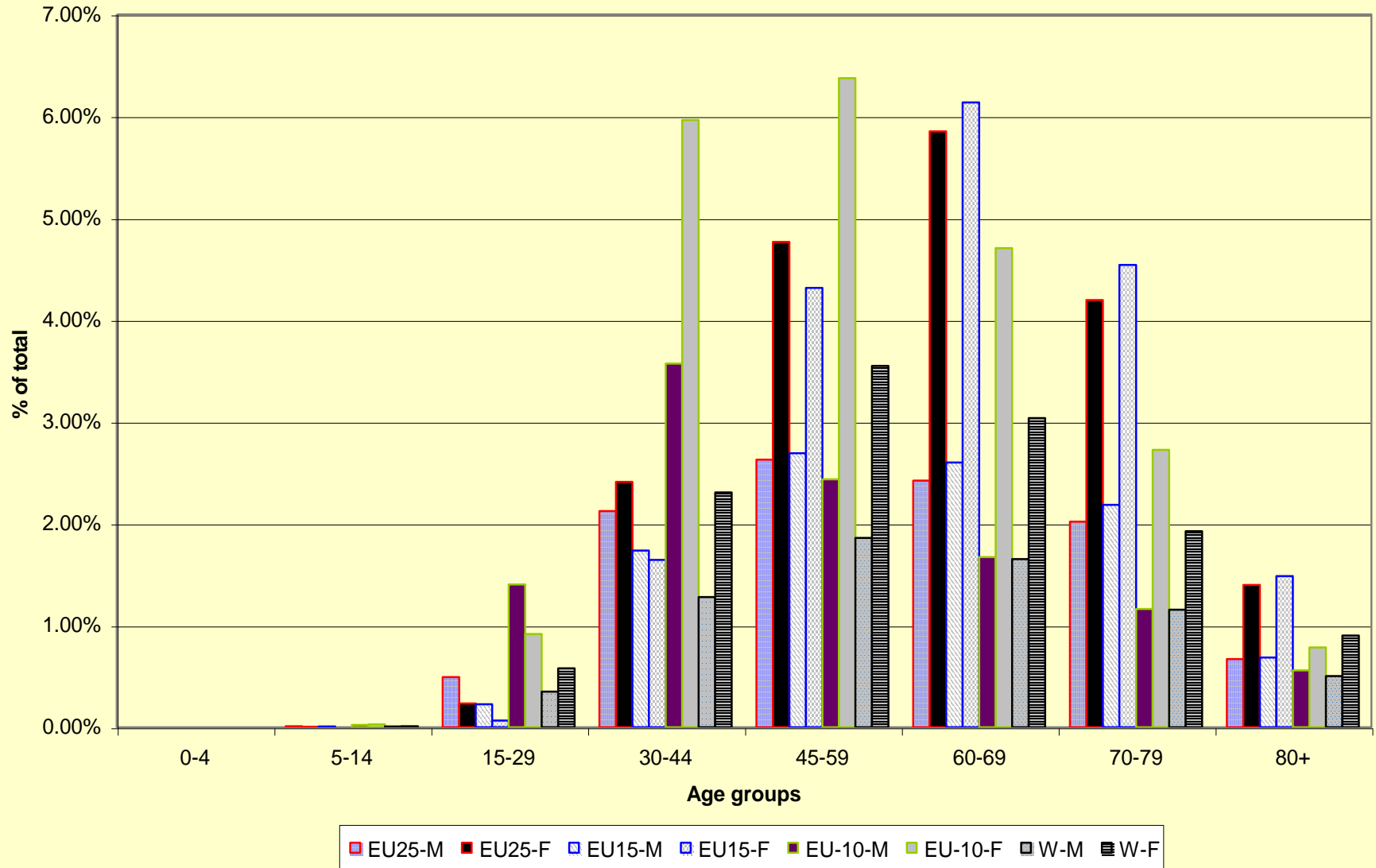
Osteoarthritis: epidemiology. Arden N, Nevitt MC Best Pract Res Clin Rheumatol. 2006 Feb;20(1):3-25
MRC Epidemiology Resource Centre, University of Southampton, Southampton General Hospital,
Tremona Road, Southampton

- **4^η σε συχνότητα αιτία «ανικανότητας» στις γυναίκες και 8^η στους άνδρες παγκοσμίως!**
- **Συχνότητα συμπτωματικής οστεοαρθρίτιδας 9,6% στους άνδρες και 18% στις γυναίκες άνω των 60 ετών!**

Jordan KM, Arden NK, Doherty M, Bannwarth B, et al. EULAR Recommendations 2003: An Evidence Based Approach to the Management of Knee Osteoarthritis: Report of a Task Force of the Standing Committee for International Clinical Studies Including Therapeutic Trials (ESCISIT). Ann Rheum Dis. 2003; 62:1145-1155.



Osteoarthritis (DALYs, by age groups & regions, 2002)



Jordan KM, Arden NK, Doherty M, Bannwarth B, et al. EULAR Recommendations 2003: An Evidence Based Approach to the Management of Knee Osteoarthritis: Report of a Task Force of the Standing Committee for International Clinical Studies Including Therapeutic Trials (ESCISIT). Ann Rheum Dis. 2003; 62:1145-1155.



ΘΕΡΑΠΕΙΑ

Το σύνολο των ενεργειών και των μέσων
που χρησιμοποιούνται για να
αντιμετωπιστεί μια
ασθένεια ή άλλη ανεπιθύμητη κατάσταση
και να αποκτήσει ξανά ο οργανισμός την
καλή του υγεία

Λεξικό Δ. Δημητράκου



Osteoarthritis

At present, **there is no cure for OA**. The management of OA is broadly divided into non-pharmacological, pharmacological, and surgical treatments. **Surgical management** is generally reserved for failed medical management where **functional disability affects a patient's quality of life**. Pharmacological management includes control of pain and improvement in function and quality of life while limiting drug toxicity. Experts in this field suggest that appropriate therapy for OA combines one or more pharmacological agents with exercise, weight loss and physical therapy (i.e. non-pharmacological therapy).

**Osteoarthritis “Opportunities to Address Pharmaceutical Gaps”
archives W.H.O. 2012**



ΕΠΙΛΟΓΕΣ ΘΕΡΑΠΕΙΑΣ ΣΤΗΝ ΟΑ

- ΜΗ ΦΑΡΜΑΚΕΥΤΙΚΗ ΑΓΩΓΗ
- ΦΑΡΜΑΚΕΥΤΙΚΗ ΑΓΩΓΗ
- ΕΝΔΑΡΘΡΙΚΑ ΣΚΕΥΑΣΜΑΤΑ
- ΧΕΙΡΟΥΡΓΙΚΗ ΘΕΡΑΠΕΙΑ



ΜΗ ΦΑΡΜΑΚΕΥΤΙΚΗ ΑΓΩΓΗ

- Education (patient and spouse or family)
- Social support
- Physiotherapy (physical therapy)
- Occupational therapy
- Weight loss
- Exercise
- Orthotic devises
- Laser
- Pulsed EMF (Electromagnetic field therapy)
- Ultrasound
- Transcutaneous electrical nerve stimulation (TENS)
- Acupuncture
- Nutrients
- Herbal remedies
- Vitamins/minerals



ΦΑΡΜΑΚΑ

- Paracetamol/Acetaminophen
- NSAIDS (Non-steroidal anti-inflammatory drugs)
[plus misoprostol or a proton pump inhibitor]*
- COX-2 inhibitors (cyclo-oxygenase-2 selective non-steroidal anti - inflammatory drugs)
- Opioid analgesics
- Hormones
- Psychotropic drugs
- SYSADOA (Symptomatic Slow Acting Drugs for OA
(avocado/soybean unsaponifiables (ASU), chondroitin, diacerein and glucosamine)
- Topical NSAIDS
- Topical capsaicin

ΕΝΔΑΡΘΡΙΚΑ ΣΚΕΥΑΣΜΑΤΑ

- Corticosteroids
- Hyaluronans
- Tidal irrigation
- PRPs

ΧΕΙΡΟΥΡΓΙΚΗ ΘΕΡΑΠΕΙΑ





Υπάρχει άλλη "θεραπεία"
εκτός της χειρουργικής;



Bachmeier CJ, March LM, Cross MJ, Lapsley HM, Tribe KL, et al.
A comparison of outcomes in osteoarthritis patients undergoing total
hip and knee replacement surgery.

Osteoarthritis Cartilage. 2001;9:137–146

- WOMAC measures improved significantly after 1 year for THA and TKA: there was **reduction in pain of 71% and 53%**, reduction of stiffness of 55% and 43% and improvement in physical function of 68% and 43%, respectively.
- MOS SF-36 measures in those having hip surgery **improved significantly for pain (222%)**, physical function (247%), physical role functioning (402%), general health (110%), vitality (143%), social functioning (169%) and mental health (114%).

For those in the knee surgery group, **significant improvement was seen for pain (175%)**, physical function (197%), physical role functioning (275%), vitality (125%) and social functioning (119%).



**Ethgen O, Bruyere O, Richy F, Dardennes C, Reginster JY.
Health-related quality of life in total hip and total knee
arthroplasty. A qualitative and systematic review of the literature.**

J Bone Joint Surg Am. 2004;86-A:963–974

- Overall, total hip and total knee arthroplasties were found to be quite effective in terms of improvement in health-related quality-of-life dimensions





ΚΟΣΤΟΣ





COST EFFECTIVENESS

(ΚΟΣΤΟΣ – ΑΠΟΤΕΛΕΣΜΑΤΙΚΟΤΗΤΑ)

- **Cost-effectiveness analysis (CEA)** is a form of economic analysis that compares the relative costs and outcomes (effects) of two or more courses of action.
- Cost-effectiveness analysis is often used in the field of **health services**, where it may be inappropriate to monetize health effect.

Black, William (1990). "A Graphical Representation of Cost-Effectiveness.". *Med Decis Making* 10 (3): 212–214.



- Typically the CEA is expressed in terms of a ratio where the denominator is a gain in health from a measure (years of life, premature births averted, sight-years gained) and the numerator is the cost associated with the health gain.
- The most commonly used outcome measures are
 - quality-adjusted life years (QALY) and
 - disability-adjusted life years (DALY)

Bleichrodt H, Quiggin J (December 1999). "Life-cycle preferences over consumption and health: when is cost-effectiveness analysis equivalent to cost-benefit analysis?". *J Health Econ* 18 (6): 681–708. doi:10.1016/S0167-6296(99)00014-4



ΟΡΟΛΟΓΙΑ

QALY ↑

DALY ↓



Cost per QALY ↓

Cost per DALY ↓

< 30.000 € : Εξαιρετικά αποδοτικό !!!

ΕΡΓΑΛΕΙΑ ΥΠΟΛΟΓΙΣΜΟΥ

- Effect : $(1\text{-score post}) / (1\text{-score pre})$
- DALY Wpost : $\text{DALY Wpre} \times \text{Effect}$
- QALY Wpost : $\text{QALY Wpre} \times \text{Effect}$

Parameters

Population and demographic

- Population
- Mortality rate
- Prevalent years lived with disability

OA

- Prevalence all
- Prevalence (grade 2 symptomatic+)
- Proportion of number of people in each grade
- Mortality relative risk (OA)
- Progression of OA severity
- Proportion of bilateral OA

Intervention (hip and knee replacement)

- Proportion of OA as primary diagnosis
- Number of operations
- Surgical death rate
- Revision rate (short term)
- Revision rate (long term)

Cost

- Hip and knee replacement
- Health expenditure for OA and all other health conditions
- Patient's out of pocket payment
- Patient's time cost
- Average weekly earnings

OA: osteoarthritis; CIHI: Canadian Institute for Health Information 2012



EVALUATION CRITERIA

- OA sequelae Definition
- Grade 2 (radiological) Definite osteophytes in hip or knee
- Grade 2 (symptomatic) Grade 2 and pain for at least 1 month in last 12
- Grade 3-4 (asymptomatic) Osteophytes and joint space narrowing in hip or knee, deformity also present for Grade 4
- Grade 3-4 (symptomatic) Grade 3+ and pain for at least 1 month in last 12

OA: osteoarthritis.

Source: The burden of disease and injury in Australia 2003.



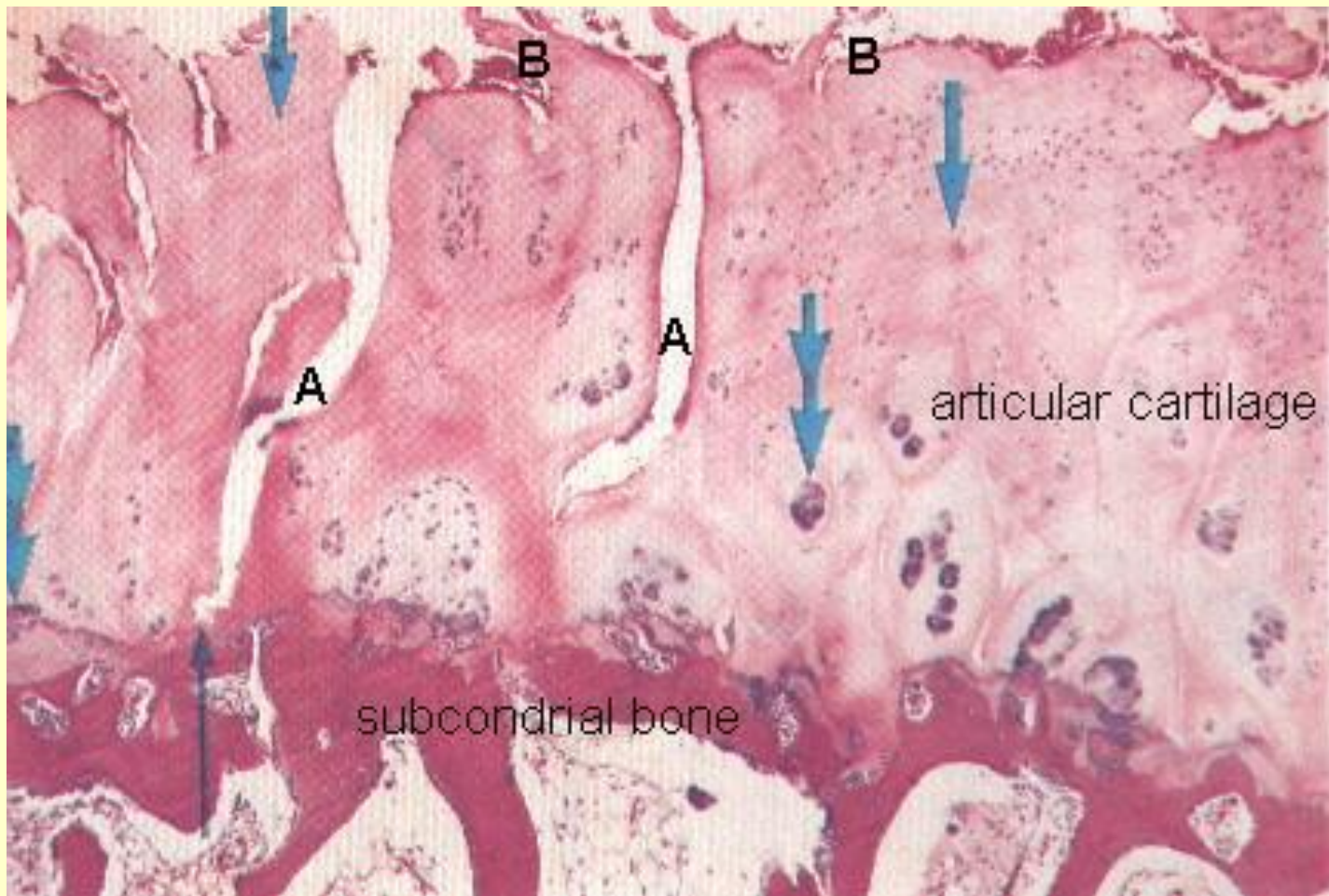
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- Arthroscopy
 - microfractures
 - mosaic plasty
 - cell therapy
 - lavage
- Osteotomy
 - preventing OA (axial disorders)
 - biological and realignment
- UKR (unicompartmental knee replacement)
- TKR (total knee replacement)
- THR (total hip reconstruction)

ΠΡΩΤΟΓΕΝΗΣ ΒΛΑΒΗ ΤΟΥ ΑΡΘΡΙΚΟΥ ΧΟΝΔΡΟΥ

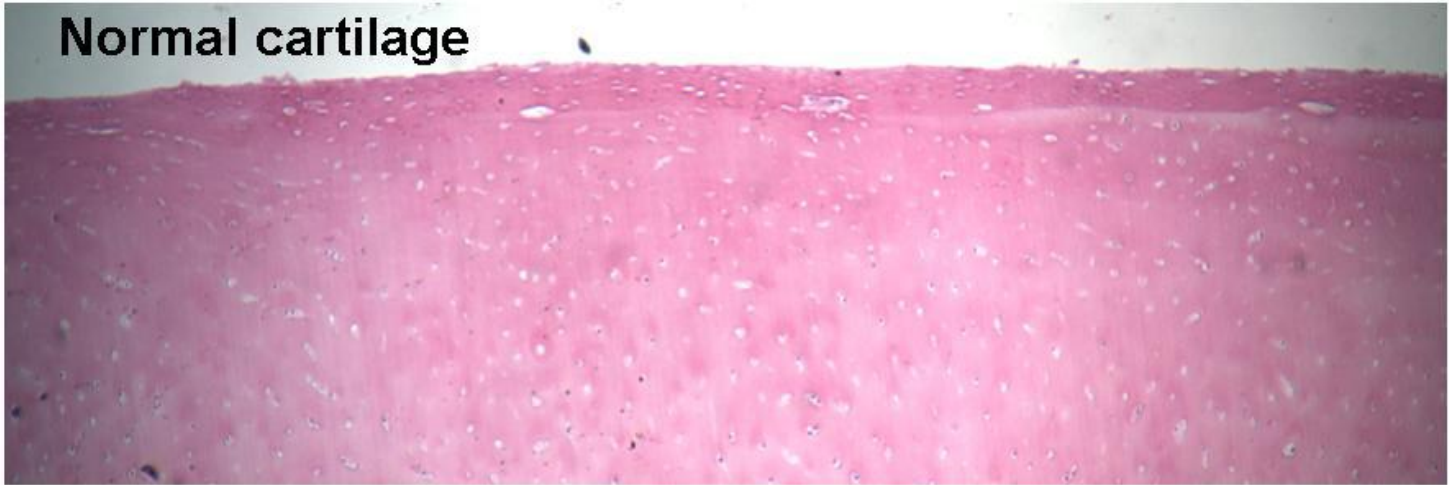


ΑΔΥΝΑΜΙΑ ΕΠΟΥΛΩΣΗΣ ΤΗΣ ΒΛΑΒΗΣ

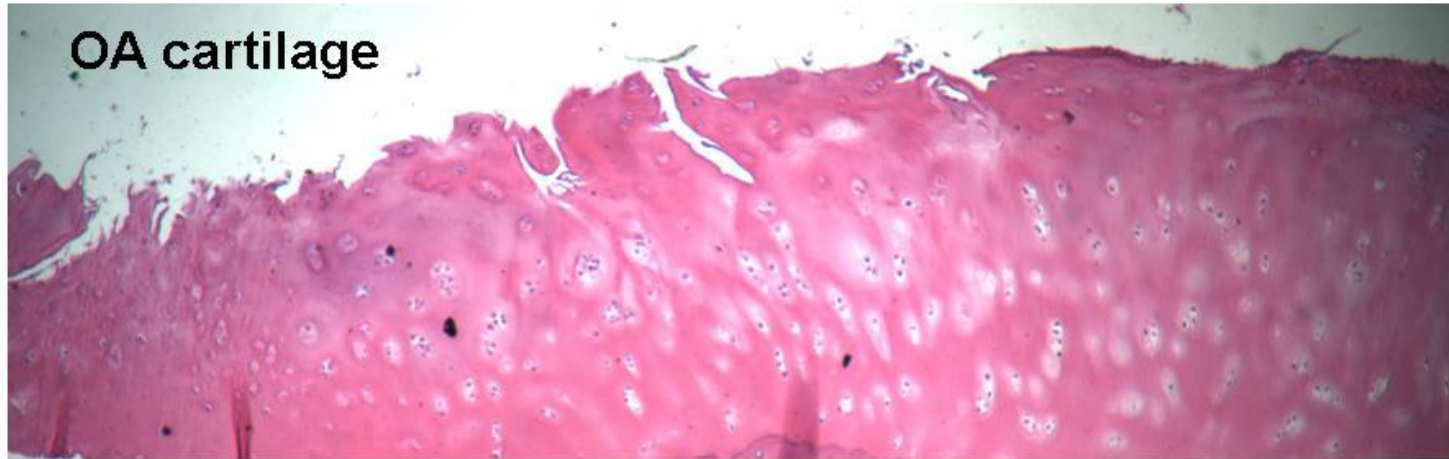


Histology of Human Normal and Osteoarthritic Cartilage

Normal cartilage



OA cartilage



ΜΙΚΡΟΚΑΤΑΓΜΑΤΑ (BONE MARROW STIMULATION)



18 μ

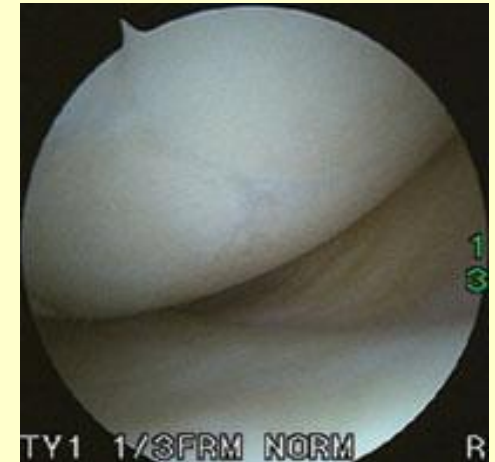
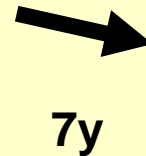
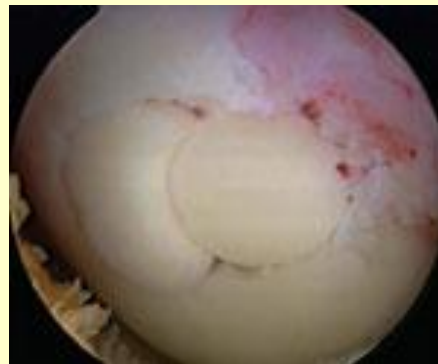
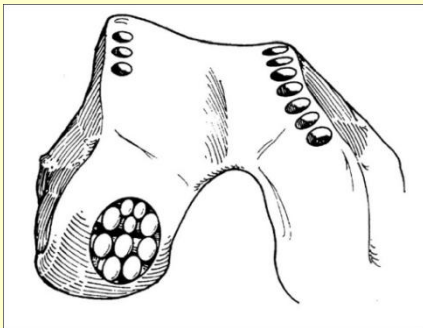


Βελτίωση συμπτωμάτων (60%-75%;;)

The Treatment of Cartilage Defects in the Knee Joint: Microfracture,
Mosaicplasty, and Autologous
Chondrocyte Implantation E. Carlos Rodríguez-Merchán, MD, PhD



Osteochondral Autograft Transplantation (OATS – Mosaic plasty)



Ικανοποιητικό αποτέλεσμα σε ποσοστό 43 – 86 %

Cartilage Regeneration and Repair, Where Are We? A Review of the Proceedings of the International Cartilage

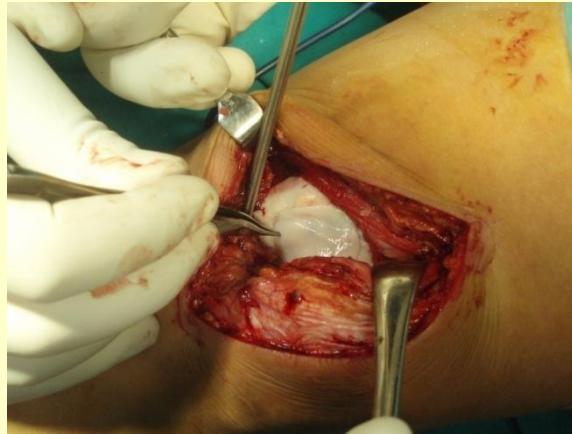
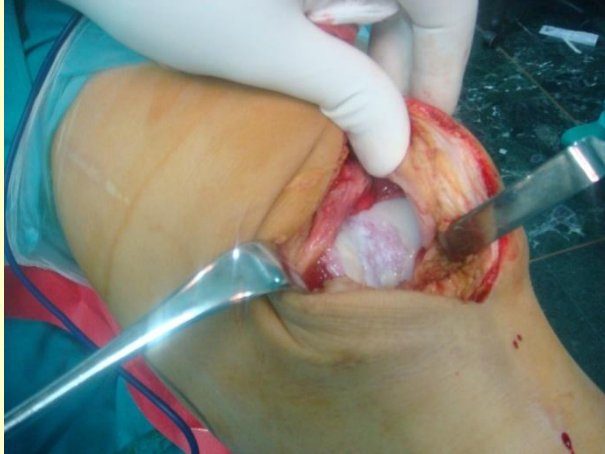
Repair Society's Second Symposium

Geoffrey B. Higgs, MD • Arthur L. Boland, MD

Sports Medicine and Shoulder Service • Massachusetts General Hospital and Harvard University



Autologous Chondrocyte Implantation



2 y



- 88% εξαιρετικά αποτελέσματα σε παρακολούθηση 5 ετίας

Clar C, Cummins E, McIntyre L, et al. Clinical and cost-effectiveness of autologous chondrocyte implantation for cartilage defects in knee joints: systematic review and economic evaluation. *Health Technol Assess.* 2005; 9(47):iii-iv, ix-x, 1-82.

Κόστος - Αποτελεσματικότητα

- ACI is more cost-effective than MF and Mosaicplasty within the 20,000 – 30,000 pounds sterling per QALY cost-effectiveness
- Quality of life gain from ACI versus microfracture would have to be between 70 and 100% greater over 2 years
- We need more sufficient evidence

Clar C, Cummins E, McIntyre L, et al. Clinical and cost-effectiveness of autologous chondrocyte implantation for cartilage defects in knee joints: systematic review and economic evaluation. *Health Technol Assess*. 2005; 9(47):iii-iv, ix-x, 1-82.



Surgical Management of Osteoarthritis

Jeffrey N. Katz, Brandon E. Earp, Andreas H. Gomoll

Arthritis Care Res (Hoboken). 2010 September; 62(9): 1220–1228.



Osteotomy is not as effective as total knee replacement in relieving pain and osteotomy fails sooner than TKA on average, prompting additional surgery. The risk of subsequent surgery following osteotomy in one series was 25% after five years of follow up, with total knee replacement accounting for about 40% of these additional surgeries. Thus, osteotomy is used primarily in younger patients with predominantly unicompartmental OA

Αρθροπλαστικές



Chang RW, Pellisier JM, Hazen GB.

A cost-effectiveness analysis of total hip arthroplasty for
osteoarthritis of the hip.

Journal of the American Medical Association.

1996;275:858–865

- THA increases QALY by about 6.9 years
- the THA cost-effectiveness ratio for men aged 85 years and older is \$4600 per QALY gained
- For persons with hip osteoarthritis associated with significant functional limitation, THA can be cost saving and cost-effective in improving QALY when both short- and long-term outcomes are considered



**Lavernia C, Guzman J, Gachupin-Garcia A.
Cost effectiveness and quality of life in knee
arthroplasty. Clin Orthop. 1997;1:134–139.**

- 30 males (average age, 62 years old) and 70 females (average age, 64 years old).
- The calculated cost per a QALY was **\$11,560 at 1 year**, and \$6656 at 2 years postsurgery.
- Health economists consider an intervention costing less than **\$30,000** per quality of well year a bargain to society



Cost-effectiveness of Total Knee Arthroplasty in the United States *Patient Risk and Hospital Volume*

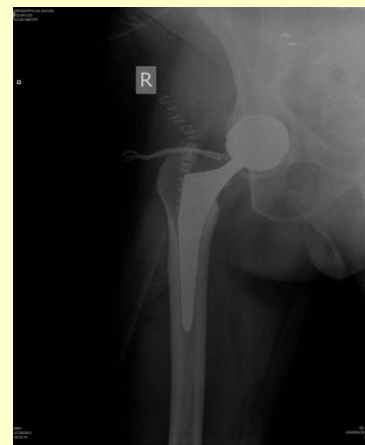
Elena Losina, PhD; Rochelle P. Walensky, MD, MPH; Courtenay L. Kessler, MS; Parastu S. Emrani, BS; William M. Reichmann, MA; Elizabeth A. Wright, PhD; Holly L. Holt, BS; Daniel H. Solomon, MD, MPH;
ARCH INTERN MED/VOL 169 (NO. 12), JUNE 22, 2009

Our analyses showed that, at an
**incremental cost of \$18 300 per QALY
gained**, TKA is a highly cost effective
procedure for management of end-stage
knee OA among Medicare-aged persons
compared with nonoperative management



A systematic review of clinical-effectiveness and cost-effectiveness and economic modeling of minimal incision total hip replacements approaches in the management of arthritic disease of the hip.
R de Verteuil et al., Health Technology asses. 2008 , 12 : 26

- Η ολική αρthroπλαστική ισχίου ελάχιστης παρεμβατικότητας (AMIS) δεν εμφανίζει σημαντικές διαφορές στο κόστος της επέμβασης αλλά προκαλεί βραχύτερη νοσηλεία και ταχύτερη επιστροφή στην εργασία.



Cost-effectiveness of total hip arthroplasty versus resurfacing arthroplasty: economic evaluation alongside a clinical trial

Richard Edlin, Sandy Tubeuf, Juul Achten, Nicholas Parsons, Matthew Costa
BMJ 11/03/2013

- Patients in the resurfacing arm had higher quality of life at 12 months (0.795 vs 0.727) and received 0.032 more QALYs within the first 12 months postoperation.
- At an additional cost of £564, resurfacing arthroplasty offers benefits at £17 451 per QALY within the first 12 months of treatment
- The shortterm follow-up in this trial should be noted, particularly in light of the concerns raised regarding adverse reactions to metal debris in the longer term.
- Longer-term follow-up of resurfacing arthroplasty patients and decision analytic modelling is also advised.



Vos T, Carter R, Barendregt J, Mihalopoulos C, Veerman
L, et al. Brisbane and Melbourne:
University of Queensland, Deakin University; 2010

Assessing cost-effectiveness in prevention
(OA Prevention): Final report.

**68,908 individuals
(30,347 males and 38,561 females) with hip OA
and
100,657 individuals (42,930 males and 57,727 females)
with knee OA**

AUD 50,000 per DALY without surgery



ΚΟΣΤΟΣ / ΧΕΙΡΟΥΡΓΕΙΟ

Government cost

• Hip replacement surgery (primary–Csc)	13,648
• Hip replacement surgery (primary+Csc & revision–Csc)	16,744
• Hip replacement surgery (revision+Csc)	30,648
• Knee replacement surgery (primary–Csc)	13,640
• Knee replacement surgery (primary+Csc & revision–Csc)	19,620
• Knee replacement surgery (revision+Csc)	35,912
• Other costs related to surgery (non-admitted visits etc.)	2,254

Patient out of pocket cost

• Out of pocket cost pre- and post-surgery (hip)	839
• Out of pocket cost pre- and post-surgery (knee)	1,019

ΧΡΟΝΙΚΟ ΚΟΣΤΟΣ

Pre-surgical visits (hip) 168

Surgery & recuperation (hip, male, primary–CscC)	2,227
Surgery & recuperation (hip, male, primary+CscC & revision–CscC)	3,781
Surgery & recuperation (hip, male, revision+CscC)	5,629
Surgery & recuperation (hip, female, primary–CscC)	1,576
Surgery & recuperation (hip, female, primary+CscC & revision–CscC)	2,677
Surgery & recuperation (hip, female, revision+CscC)	3,985

Pre-surgical visits (knee) 171

Surgery & recuperation (knee, male, primary–CscC)	2,096
Surgery & recuperation (knee, male, primary+CscC & revision–CscC)	4,197
Surgery & recuperation (knee, male, revision+CscC)	6,246
Surgery & recuperation (knee, female, primary–CscC)	1,484
Surgery & recuperation (knee, female, primary+CscC & revision–CscC)	2,970
Surgery & recuperation (knee, female, revision+CscC)	4,422

Cost-Effectiveness of Total Hip and Knee Replacements for the Australian Population with Osteoarthritis: Discrete-Event Simulation Model

Hideki Higashi and Jan J. Barendregt ,Pieter H. M. van Baal, Editor 2012



Scenario	Hip (AUD per DALY averted)		Knee (AUD per DALY averted)	
	Mean	95%UI	Mean	95%UI
<i>With cost offset</i>				
Without time cost	3,600	3,200 – 4,200	10,000	8,400 – 12,000
With time costs	5,000	4,200 – 6,200	12,000	10,000 – 15,000
<i>Without cost offset</i>				
Without time cost	10,000	9,000 – 12,000	19,000	16,000 – 23,000
With time costs	12,000	10,000 – 13,000	21,000	18,000 – 26,000

Vos T, Carter R, Barendregt J, Mihalopoulos C, Veerman L, et al. Brisbane and Melbourne: University of Queensland, Deakin University; 2010. Assessing cost-effectiveness in prevention (ACE-Prevention)

- In conclusion, the findings suggest that both hip and knee replacements are highly cost-effective with ICERs significantly lower than the AUD 50,000 per DALY threshold level.
- Hip replacements were substantially more cost-effective than knee replacement

www.who.int/bulletin/volumes/81/9/PHC.pdf

PUBLIC HEALTH CLASSICS

2012

For patients with progressive joint destruction, modern surgical techniques with hip and knee replacements provide enormous relief in terms of pain alleviation and reduction of disability. These operations are among the most cost-effective surgical procedures available, with a cost per DALY (disability-adjusted life year) in the order of Australian dollars 8000 and Australian dollars 12 000 (approximately US\$ 4800 and US\$ 7200) respectively.



Μηνύματα :

- Στις περιπτώσεις προχωρημένης οστεοαρθρίτιδας γονάτων ισχύων η χειρουργική αντιμετώπιση έχει τα καλύτερα κλινικά αποτελέσματα
- Στη χειρουργική πρόληψη της οστεοαρθρίτιδας η αυτόλογη μεταμόσχευση χονδροκυττάρων είναι αποτελεσματικότερη αναλογικά με το κόστος , συγκριτικά με τα μικροκατάγματα και την πλαστική μωσαϊκού, αλλά χρειάζονται μεγαλύτερες χρονικά μελέτες



Μηνύματα :

- Οι ολικές αρthroπλαστικές ισχίου και γόνατος είναι σημαντικά αποτελεσματικότερες αναλογικά με το κόστος τους, συγκριτικά με τη συντηρητική αντιμετώπιση της ΟΑ
- Οι αρthroπλαστικές ελάχιστης παρεμβατικότητας υπερέχουν των κλασσικών ως προς το Κ/Α μόνο κατά το 1^ο μετεγχειρητικό έτος. Απαιτούνται μεγαλύτερες μελέτες



Μηνύματα :

- Οι αρthroπλαστικές επιφανείας υπερέχουν ως προς το Κ/Α συγκριτικά με τις κλασσικές μεθόδους αλλά έχουν μικρότερο χρόνο ζωής και αναμένονται τα αποτελέσματα μελετών που θα περιλαμβάνουν και τις επεμβάσεις αναθεώρησης αυτών σε ολικές αρthroπλαστικές
- Δεν υπάρχουν παγκοσμίως μελέτες για «φθηνές» μεθόδους αντιμετώπισης της ΟΑ, όπως για τις αρthroδέσεις, αρthroπλαστικές εκτομής κ.λ.π. ;;;





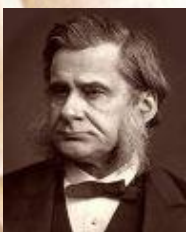
Το μεγαλύτερο δώρο είναι η υγεία. Ο μεγαλύτερος πλούτος είναι η ικανοποίηση.

Και η καλύτερη σχέση είναι η πίστη.

Βούδας, 563-483 π.Χ.,

Μια εγχείριση δεν είναι ποτέ άχρηστη. Μπορεί να μην ωφελήσει τον εγχειριζόμενο, αλλά ωφελεί πάντα τον χειρουργό.

Georges Feydeau, 1862-1921, Γάλλος θεατρικός συγγραφέας



Η Οικονομία δεν έχει να κάνει με την εξοικονόμηση χρημάτων αλλά με το πώς να ξοδεύονται χρήματα με σοφό τρόπο.

Thomas Huxley, 1825-1895, Βρετανός βιολόγος



**ISAKOS OFFICIAL
TEACHING CENTER**



Ευχαριστώ για την προσοχή σας!