

Medical Management of the Young Arthritic Knee

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Overview

- Review of early pathological process
- What are the medical options
 - » Risk factors
 - » Mechanical alignment
 - » Analgesia strategies
- Evidence
- Summary

osteoarthritis

| | Standard definition | More stringent definition | P value |
|--------------------|---------------------|---------------------------|---------|
| Any abnormality | 0.06 | <0.001 | |
| Chondrocytes | 0.007 | 0.01 | |
| Cartilage damage | <0.001 | <0.001 | 0.79 |
| Bone marrow lesion | 0.06 | 0.33 | |
| Synovitis | 0.10 | 0.01 | |
| Effusion | 0.24 | 0.003 | |
| Subchondral cyst | 0.004 | 0.06 | |
| Mechanical damage | <0.001 | <0.001 | |
| Ligamentous damage | 0.06 | 0.43 | |

Articular surface
Tide mark
Calcified cartilage
Subchondral bone
Cancellous bone
Superficial tangential zone (50-20%)
Middle zone (40-60%)
Deep zone (20%)

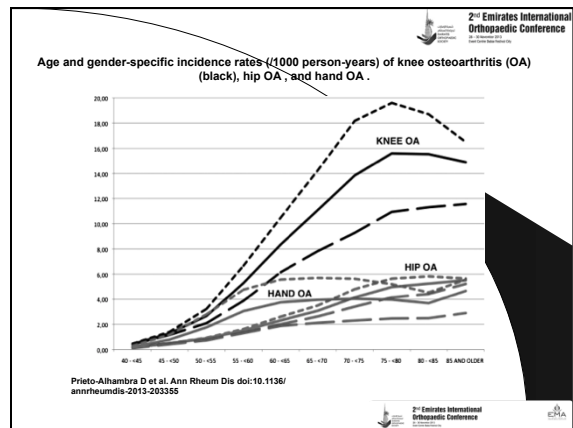
Age group (years): 15-40 (n=311), 40-70 (n=249), 70-85 (n=143)

What are the options?

1 - Address risk factors

1 - Risk Factors

- Female sex
- Inflammatory joint disease
- Obesity
 - Strongest modifiable factor
- Occupation requiring repetitive knee bending
- Age
- Previous knee injury
- Smoking seems to be protective



What are the options?

A pie chart divided into two segments. The left segment is labeled '1 - Address risk factors' and the right segment is labeled '2 - External support'.

2 - External Support

- Off-loading bracing and wedges
 - Wedged insoles
 - Both correct alignment and improve walking speed
- Shock absorbing braces
- Walking aids
- Shock absorbing insoles

A photograph of a white and black shock absorbing brace designed for the ankle and foot.

Evidence

| Category | Baseline (mm) | Custom (mm) | Off-the-Shelf (mm) |
|-----------|---------------|-------------|--------------------|
| Pain | ~200 | ~100 | ~150 |
| Stiffness | ~100 | ~50 | ~100 |
| Function | ~650 | ~250 | ~450 |

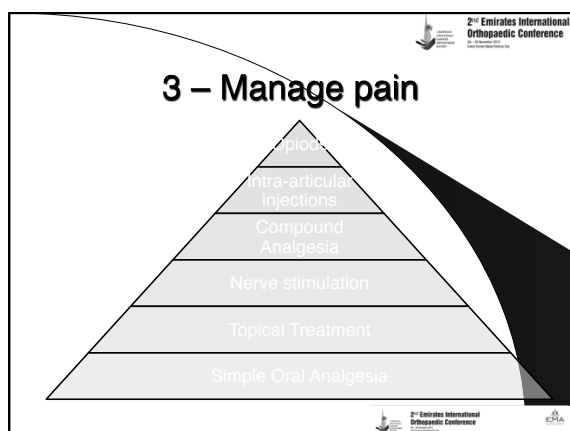
A line graph showing the relationship between Step Stance (%) on the x-axis (0 to 100) and Moments (% BW*LLL) on the y-axis (-8 to 2). Three lines represent Baseline (solid), Custom (dashed), and Off-the-Shelf (dotted). All lines show a negative moment during the stance phase, with the Custom condition showing the most significant reduction in moment.

What are the options?

A pie chart divided into three segments. The top-left segment is labeled '1 - Address risk factors', the top-right segment is labeled '2 - External support', and the bottom segment is labeled '3 - Manage Pain'.

N.I.C.E. targeting treatment

A circular flowchart illustrating various treatment options for knee osteoarthritis. The central core includes 'education, advice, information access', 'strengthening exercise', 'aerobic fitness training', and 'weight loss if overweight/obese'. Surrounding this are several treatment categories: 'oral NSAIDs including COX-2 inhibitors', 'capsaicin', 'topical NSAIDs', 'opioids', 'intra-articular corticosteroid injections', 'local heat and cold', 'assistive devices', 'joint arthroplasty', 'manual therapy (manipulation and stretching)', 'TENS', 'shock-absorbing shoes or insoles', and 'supports and braces'.



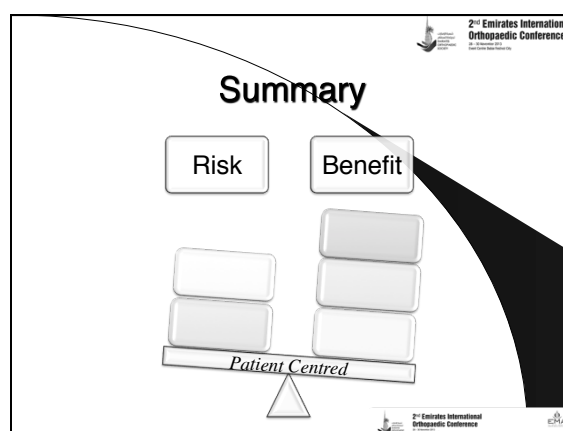
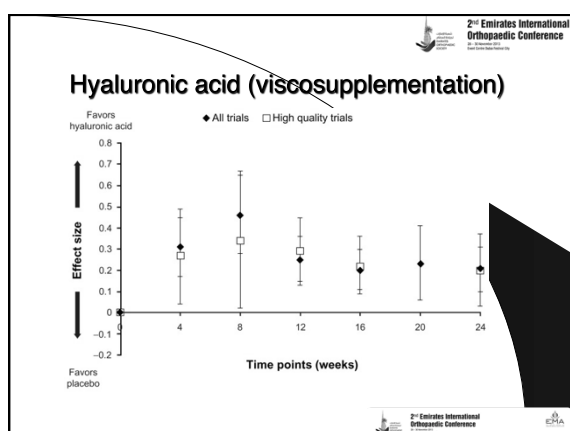
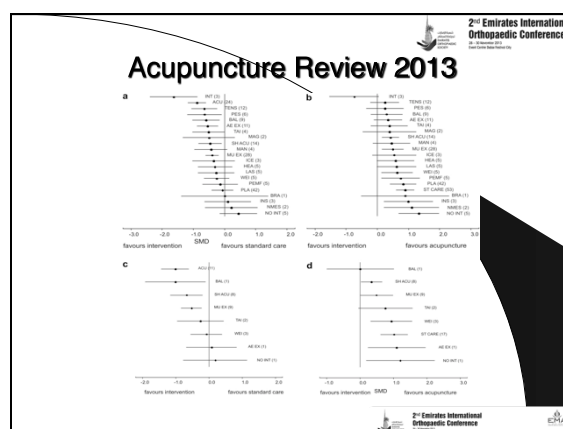
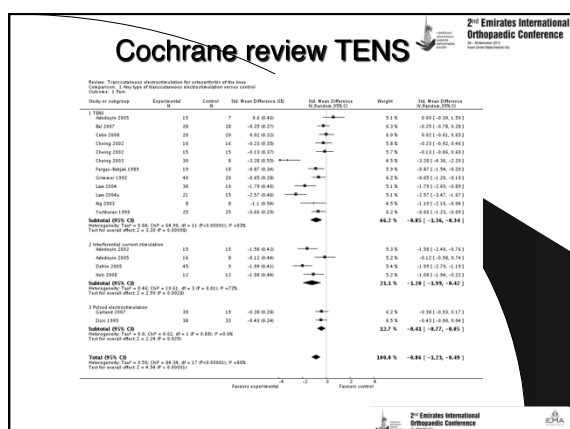
Evidence

Inconsistent or limited-quality patient-oriented evidence

- Chondroitin / Glucosamine Supplementation ¹
- Tramadol
- Physical therapy exercise ²
- TENS ⁷
- Pulsed electromagnetic field

Consistent, good-quality patient-oriented evidence

- Non-steroidal anti-inflammatory medication ³
- Intra-articular injection provides short term benefit ^{4,5}
- Acupuncture ⁶
- Topical treatment
 - Capsaicin
 - Non-steroidal
- Hyaluronic acid injection ⁸



References

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- 2 - Walter H, Ettlinger Jr, MD, Robert Burns, Mj, et al. A Randomized Trial Comparing Aerobic Exercise and Resistance Exercise With a Health Education Program in Older Adults With Knee Osteoarthritis. *JAMA*. 1997;277(1):25-31
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- 4 - Arroll B, Goodyear-Smith F. Corticosteroid injections for osteoarthritis of the knee: meta-analysis. *BMJ*. 2002;325(7262):1290-1293
- 5 - Stephens MB, Beutler AI, O'Connor FG. Musculoskeletal injections: a review of the evidence. *Am Fam Physician*. 2003;67(10):1976.
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- 7 - Rutjes AW, Nuesch E, Sterchi R, et al. Transcutaneous electrostimulation for osteoarthritis of the knee. *Cochrane Database Syst Rev*. 2008 Oct 7;(4)
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Knee Osteoarthritis

- Common
- Affects 34% of patients over 45
- Increasing demand for knee replacement
- 3.48 million by 2030

Kurtz et al JBJS am. 2007

Treatment of earlier disease

We need to understand the pattern of early disease.

Early OA of the Knee

- How do we identify patients with early disease?

dGEMRIC

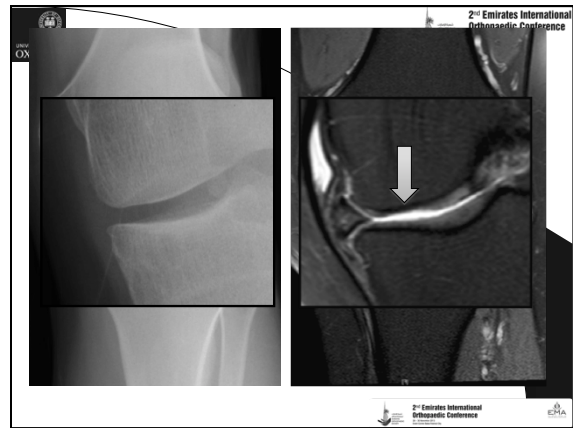
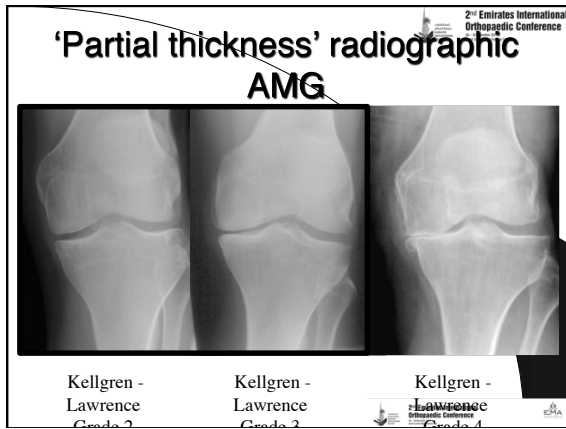
- Delayed Gadolinium MRI of Cartilage
- proteoglycan assessment

T₂ Mapping

- Collagen assessment

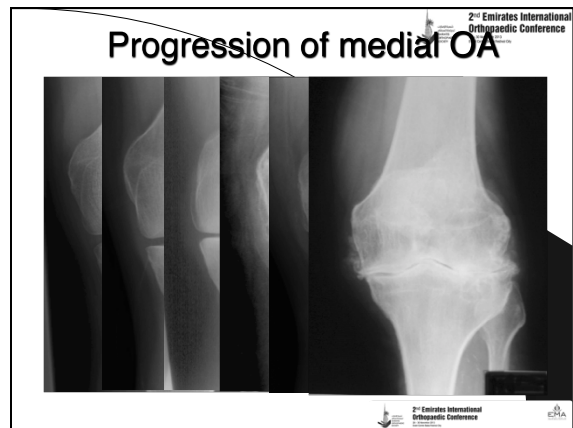
Fig. 3

A delayed gadolinium-enhanced MRI of cartilage (dGEMRIC) scan of the knee showing slices from the medial (left) and lateral (right) compartments. The scale (ms) represents the dGEMRIC index (T_{2rho}). The colour scale applied to the image facilitates visual interpretation. Higher values of T_{2rho} represent increased glycosaminoglycan (GAG) content. The scan demonstrates the physiological reduction in concentration of GAG as one moves from the deep to superficial cartilage zones, particularly clearly for the tibial cartilage of the lateral compartment. The tibial cartilage of the medial compartment demonstrates a relative depletion of GAGs anteriorly compared with posteriorly, in the absence of chondral erosion, suggesting early anteromedial osteoarthritis (image kindly provided by Dr Deborah Burstein, Beth Israel Deaconess Medical Center, Boston).



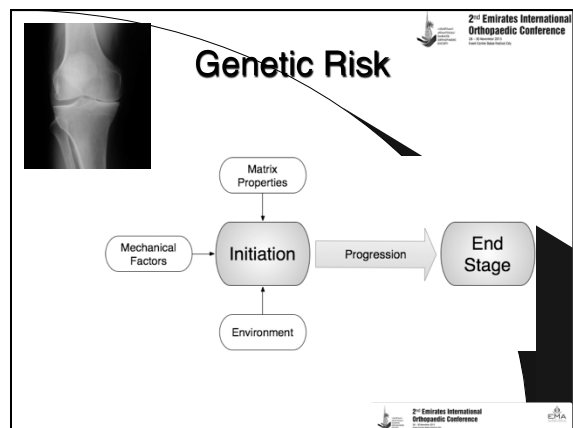
Progression Line for Knee medial OA

| | | | |
|--------|----------------|-------------------------------------|---|
| Normal | Subclinical | Early OA 'Partial Thickness' | End Stage 'Bone on Bone' |
| | | Progression → | |
| | Symptoms Begin | Symptomatic: Best treatment unknown | Symptomatic: Established treatment (Arthroplasty) |

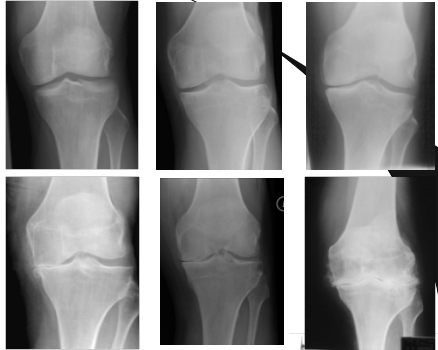


Time Line for Knee OA

| | | | | |
|------------------|--------|------------------------|-------------------------------------|---|
| | Normal | Subclinical | Early OA 'Partial Thickness' | End Stage 'Bone on Bone' |
| | | | Progression → | |
| Clinical Pathway | | Symptoms Begin | Symptomatic: Best treatment unknown | Symptomatic: Established treatment (Arthroplasty) |
| Diagnostic Tool | | | MRI | X-Ray |
| | | dGEMRIC | | |
| | | T ₂ Mapping | | |



Progression of medial OA




The image displays six X-ray views of a knee joint, arranged in two rows of three. The top row shows the knee in a neutral position, while the bottom row shows it in a flexed position. The images illustrate the progression of medial osteoarthritis (OA) from an early stage with minimal joint space narrowing to a late stage with significant joint space loss and bone spurts.

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Obesity

Daily Telegraph 26/10/06
Britain is the fattest country in Europe
Figures show that 23 per cent of adults obese.

| | |
|---------|--------|
| Spain | (13.1) |
| Germany | (12.9) |
| France | (9.4) |
| Italy | (8.5) |



The photograph shows a person from behind, sitting on a folding chair. Their legs are spread wide apart, and they appear to be wearing very large pants, which is a visual representation of obesity.

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