Welsh Orthopaedic Society Annual Meeting 2025

Podium Presentation Session 1: Hip, Knee

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Enhancing Informed Consent in Orthopaedic Surgery: A Proof Of Concept Study of Language Model-Generated Clinic Letters

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2. Morriston Hospital, Swansea, UK



Background

Patient-Centred Consent:

- A Clinical and Legal Imperative: The landmark Montgomery v Lanarkshire (UK Supreme Court, 2015) ruling mandates clinicians to clearly communicate all material risks, benefits, and alternative treatment options using patient-friendly, comprehensible language.
- Effective consent ensures patients make informed decisions, improves satisfaction, and reduces litigation risks.

Administrative Challenges in Orthopaedic Practice:

- Orthopaedic outpatient clinics face substantial administrative pressure, especially with high-volume procedures like total hip replacement
- Crafting detailed, personalised consent letters to document patient-clinician discussions thoroughly is often compromised by workload and time constraints,

Emergence of Large Language Models (LLMs)

- Recent advancements have led to powerful, context-aware generative language models such as ChatGPT (OpenAI), Google Gemini, DeepSeek, and Microsoft Copilot.
- Preliminary surgical studies suggest LLMs not only reduce administrative burdens but also inspire novel approaches to clinical documentation and research.

Potential Benefits of LLM Integration in Healthcare:

- Rapid generation of detailed, personalised clinic letters can significantly shorten consultation times, creating more direct interaction opportunities between clinicians and patients.
- Cost-effectiveness: Reduced reliance on expensive transcription services and administrative support.

Identified Evidence Gap and Research Need

- Despite promising early studies, there is currently no rigorous comparative evaluation of orthopaedic clinic letters generated by LLMs against those authored traditionally by clinicians.





Aim: Our aim is to assess various Large language Models ability versus human dictated letters to create clinic letters that empower patients during the consenting process

Methods

Procedure Selection
– Chose six high-volume, everyday orthopaedic operations (e.g., total hip and knee arthroplasty, Arthroscopic Anterior Cruciate Ligament Reconstruction, Arthroscopic Meniscal Repair, Arthroscopic Rotator Cuff Repair, Carpal Tunnel decompression)

Prompt Design
– Built one clinic-friendly prompt per procedure (≤ 500 words, 11–12 yr reading age). Each letter to incorporate complication profile from AAOS

Letter Generation
– Entered each prompt into **four LLMs** (ChatGPT, Gemini, DeepSeek, Copilot).
– Requested **two independent letters** from every model → **48 AI letters** total.
– Dictated matching letters from 2 human authors (SHO + Registrar level).

Assessment Framework
– **Understandability:** PEMAT-P checklist scored by three blinded assessors.
– **Readability:** analyzed with the "Readable" web tool.

- Gunning Fog - estimates years schooling needed, weighing sentence length and complex word percentage in texts.
- Flesch-Kinkaid - calculates readability by relating syllables and words per sentence to U.S. grade levels approximately.
- SMOG - reading grade using polysyllable counts across sample sentences, suited to health materials readability.

– **Complication Compliance:** Single assessor checked inclusion of key postoperative complications.

Comparative Analysis
– AI vs. human letters for PEMAT and readability metrics.
– Cross-model comparison of complication compliance.

Please write a clinic letter to a patient who has been assessed for the following operation. It is to be based on the following information. The letter is to be at the reading age of an 11-12 year-old and in a clinic letter format (paragraph form). Include all clinical information listed below. List complications as listed in the respective complication profile source with an explanation for each. The letter is to be 500 words in total.
Name: John Smith
Date of Birth: 01/01/1950
Operation: Arthroscopic Rotator Cuff Repair
Mechanism of Injury: A fall on a outstretched hand with a high impact force.
Clinical Findings: Patient presents with shoulder pain, weakness, painful arc, drop arm sign, night pain, limited ROM, and positive external rotation lag test.
Radiological Evidence: Findings consistent with a full-thickness supraspinatus tear, retracted tendon, subacromial-subdeltoid bursitis, and superior migration of humeral head. Moderate muscle atrophy noted. No evidence of fracture or labral tear
Follow-up: 2 week wound review, 6 follow up clinic, 24 week follow up clinic
Weight Bearing status: Full weight bearing
VTE prophylaxis: Not required
Complication Profile Source: AAOS

Results – Letter Creation

Clinic Letter
Patient Name: Mr. John Smith
Date of Birth: 01/01/1950
Operation Planned: Total Hip Replacement

Dear Mr. Smith,

Thank you for coming to the clinic to talk about your planned total hip replacement. You have progressive osteoarthritis in your hip, meaning the joint has worn out over time. This wear causes pain, stiffness, swelling, and a reduced range of motion. Your X-rays show that the space in your joint is getting narrower, and there are bony bumps (osteophytes) and thickening of the bone underneath the cartilage (subchondral sclerosis).

A total hip replacement involves taking out the damaged parts of your hip and replacing them with artificial parts made of metal or plastic. The goal is to ease your pain and help you move better. This operation is usually done under a spinal or general anesthetic. After the surgery, you can put as much weight on your new hip as feels comfortable. You will also take a blood-thinning treatment (known as VTE prophylaxis) for four weeks to reduce the risk of blood clots.

You will have three follow-up visits to check on your healing and progress:

- **2-week wound review:** We will look at your wound to make sure it is clean and healing well.
- **6-week follow-up:** We will check your hip movement, strength, and comfort.
- **24-week follow-up:** We will assess how well you are doing over the longer term.

Like any surgery, a total hip replacement can have risks. According to the American Academy of Orthopaedic Surgeons (AAOS), the possible complications include:

1. **Infection:** Germs may enter the wound or joint, causing redness, warmth, swelling, and pain. If an infection is severe, you may need another procedure to clean the joint.
2. **Blood clots:** These can form in the leg veins or lungs, causing symptoms like calf swelling, pain, chest pain, or shortness of breath. Blood-thinning medicine helps reduce this risk.
3. **Dislocation:** The new hip parts can move out of place, causing sudden pain and difficulty moving. You may need to wear a brace, and in a few cases, more surgery might be required to fix it.
4. **Nerve or blood vessel injury:** Rarely, the nerves or blood vessels around the hip can be harmed, possibly causing numbness, tingling, or weakness in the leg.
5. **Leg length difference:** Sometimes one leg can feel longer or shorter after surgery. If this becomes a problem, a small shoe insert can help.
6. **Loosening or wear:** Over many years, the hip parts can loosen or wear out. If this causes pain or trouble moving, another operation may be needed.
7. **Allergic reaction:** A small number of people can have an allergic response to certain medicines, cleaning solutions, or the materials in the implants. Symptoms may include rash, itchiness, or breathing difficulties. Please let us know if you have had any allergies in the past.

These problems do not happen often, and we will do our best to keep you safe. Physical therapy after surgery will help you regain strength and movement. It is important to do your exercises, follow our advice about rest and activity, and keep your follow-up appointments. If you have any questions or worries, please call the clinic.

Thank you for placing your trust in our team. We look forward to helping you feel better and move more comfortably.

Yours sincerely,

Dr. [Your Name]
[Your Title/Position]
[Clinic/Hospital Name]

ChatGPT

deepseek

Clinic Letter

Patient Name: John Smith
Date of Birth: 01/01/1950
Date of Assessment: [Insert Date]

Dear Mr. Smith,

Following your recent assessment, I am writing to confirm the details of your upcoming surgery and the plan for your recovery. You have been diagnosed with a complex bucket-handle tear of the medial meniscus in your right knee, which occurred due to a twisting movement while your knee was bent and bearing weight. This injury has caused symptoms such as locking, giving way of the knee, tenderness along the joint line, and a positive McMurray's test. The MRI scan of your knee confirmed the tear, showing a displaced fragment in the intercondylar notch (known as the "double PCL sign"). The meniscus is also extruded by 4 mm, indicating significant damage. Additionally, there is moderate joint swelling and bone marrow edema in the medial femoral condyle, suggesting a stress injury.

The recommended treatment is an **arthroscopic meniscal repair**, a minimally invasive procedure to fix the torn meniscus. This surgery aims to restore the normal function of your knee and prevent further joint damage.

After the surgery, your recovery will be closely monitored. You will need to follow a structured rehabilitation plan:

- **Weeks 1-6:** You will be non-weight-bearing (NWB) or partially weight-bearing (PWB) using crutches. A knee brace will be provided and locked in extension to protect your knee.
- **Weeks 6-8:** You can gradually transition to full weight-bearing (FWB) if healing progresses well. The brace should still be worn, especially during deep flexion.
- **Weeks 8-12:** You can wean off crutches and progress to FWB as tolerated. Closed-chain strengthening exercises will begin to rebuild strength and stability.
- **Beyond 12 weeks:** You can return to normal activities but should avoid high-impact sports (e.g., running, jumping) for 4-6 months to prevent reinjury. Your progress will be guided by your pain levels, healing, and clinical assessments.

You will have follow-up appointments at **2 weeks** (wound review), **6 weeks**, and **24 weeks** to monitor your recovery.

To reduce the risk of blood clots (venous thromboembolism or VTE), you will be given VTE prophylaxis while you are non-weight-bearing.

As with any surgery, there are potential complications, which are important to be aware of. According to the American Academy of Orthopaedic Surgeons (AAOS), these include:

1. **Infection:** Although rare, there is a small risk of infection at the surgical site. This can usually be treated with antibiotics.
2. **Blood Clots (Deep Vein Thrombosis or Pulmonary Embolism):** Prolonged immobility increases the risk of blood clots. VTE prophylaxis will help reduce this risk.
3. **Stiffness or Reduced Range of Motion:** Some patients experience stiffness after surgery. Physical therapy will help restore movement.
4. **Persistent Pain or Swelling:** While most patients recover well, some may experience ongoing pain or swelling, which may require further treatment.
5. **Failure of the Repair:** In some cases, the meniscus may not heal properly, potentially requiring additional surgery.

If you have any questions or concerns before your surgery, please do not hesitate to contact the clinic. We are here to support you throughout your treatment and recovery.

Yours sincerely,

Results - Understandability

	ChatGPT	Gemini	Deepseek	Copilot	Human
PEMAT	0.72 (+/- 0.07)	0.83 (+/- 0.05)	0.81 (+/- 0.09)	0.81 (+/- 0.08)	0.72 (+/- 0.03)

Table 1. Descriptive statistics for PEMAT-P understandability scores.

LLM		Mean Difference	P Value
Human	Copilot	-.08333*	P <0.05
	Deepseek	-.08565*	P <0.05
	Gemini	-.10417*	P <0.05
	O1	0.0046	P = 1

Table 2. Bonferroni-adjusted pair-wise comparisons between clinician-dictated letters and large-language-model outputs.

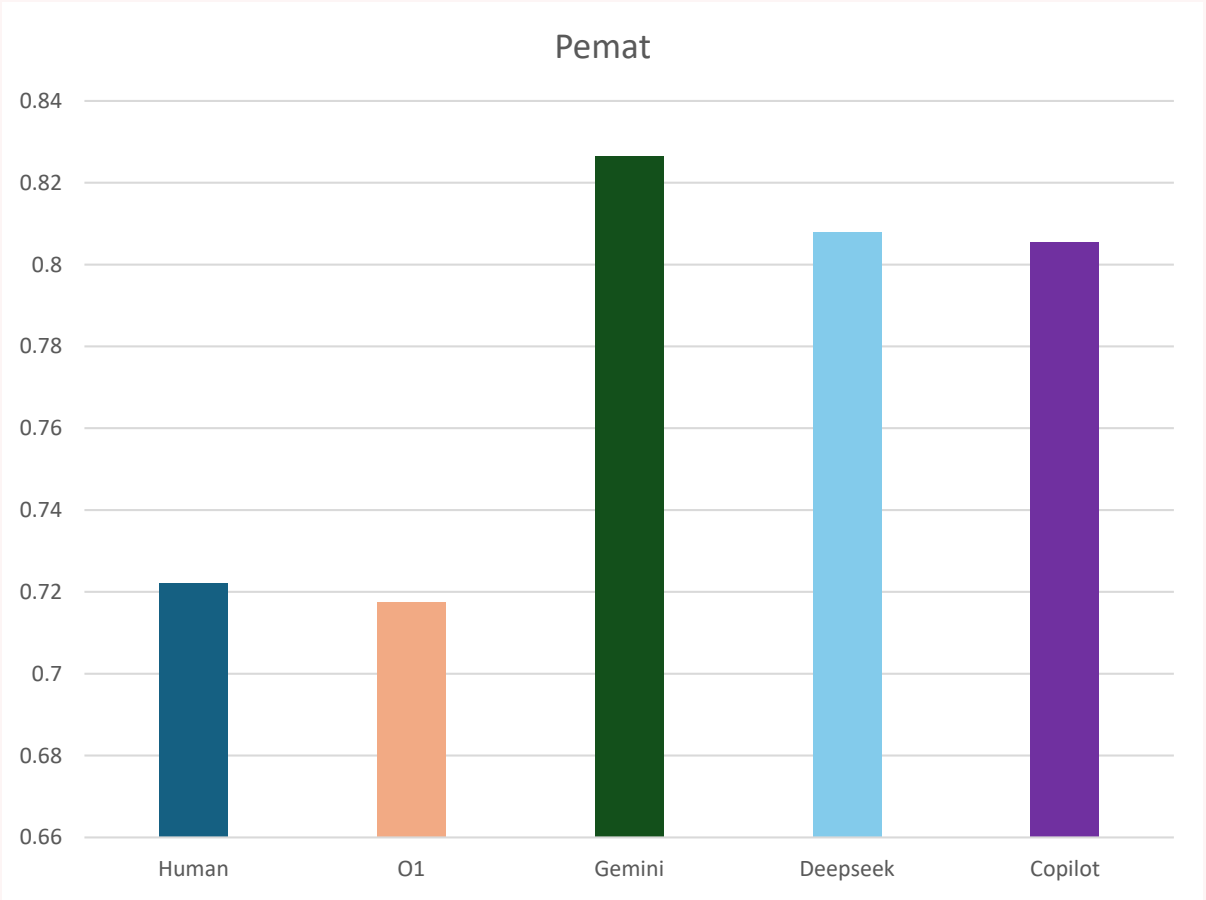


Figure 1. Mean PEMAT-P (Patient Education Materials Assessment Tool—Printable) scores for clinic letters generated by four large-language-model platforms (ChatGPT, Gemini, DeepSeek, Microsoft Copilot) compared with clinician-dictated letters.

Results - Readability

	LLM	Reading Age - Grade
Flesch-Kincaid	Copilot	8.5167
	Deepseek	8.4917
	Gemini 2.0	8.225
	O1	6.85
	Human	10.575
Gunning Fog	Copilot	10.4917
	Deepseek	10.5167
	Gemini 2.0	10.675
	O1	8.8833
	Human	14.13333
SMOG	Copilot	11.5833
	Deepseek	11.4583
	Gemini 2.0	11.5
	O1	9.9833
	Human	13.33333

Table 3. Descriptive statistics for readability (grade level) across readability formulas.

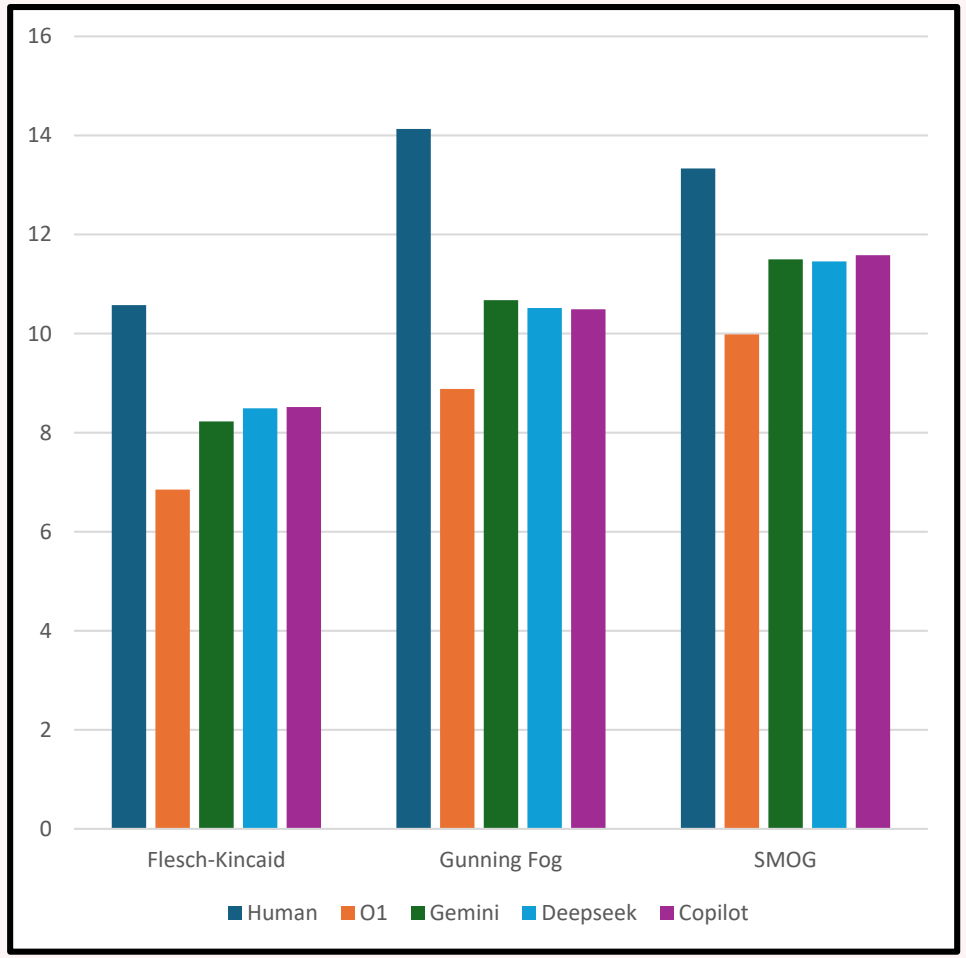


Figure 2. Mean reading-grade levels of clinic letters estimated with three established readability formulas—Flesch-Kincaid Grade Level, Gunning Fog Index, and Simple Measure of Gobbledygook (SMOG)—for four large-language-model platforms (GPT-4o "O1", Gemini 2.0, DeepSeek, Microsoft Copilot) compared with clinician-dictated letters.

	LLM	LLM	Mean Differences	P Value
Gunning-Fogg	Human	Copilot	3.64167*	<.001
		Deepseek	3.61667*	<.001
		Gemini	3.45833*	<.001
		O1	5.25000*	<.001
Flesch-Kinkaid	Human	Copilot	2.05833*	<.001
		Deepseek	2.08333*	<.001
		Gemini	2.35000*	<.001
		O1	3.72500*	<.001
Smog	Human	Copilot	1.75000*	<.001
		Deepseek	1.87500*	<.001
		Gemini	1.83333*	<.001
		O1	3.35000*	<.001

Table 4. Bonferroni-adjusted pair-wise comparisons between clinician-dictated letters and large-language-model outputs.

Results – Complication Compliance

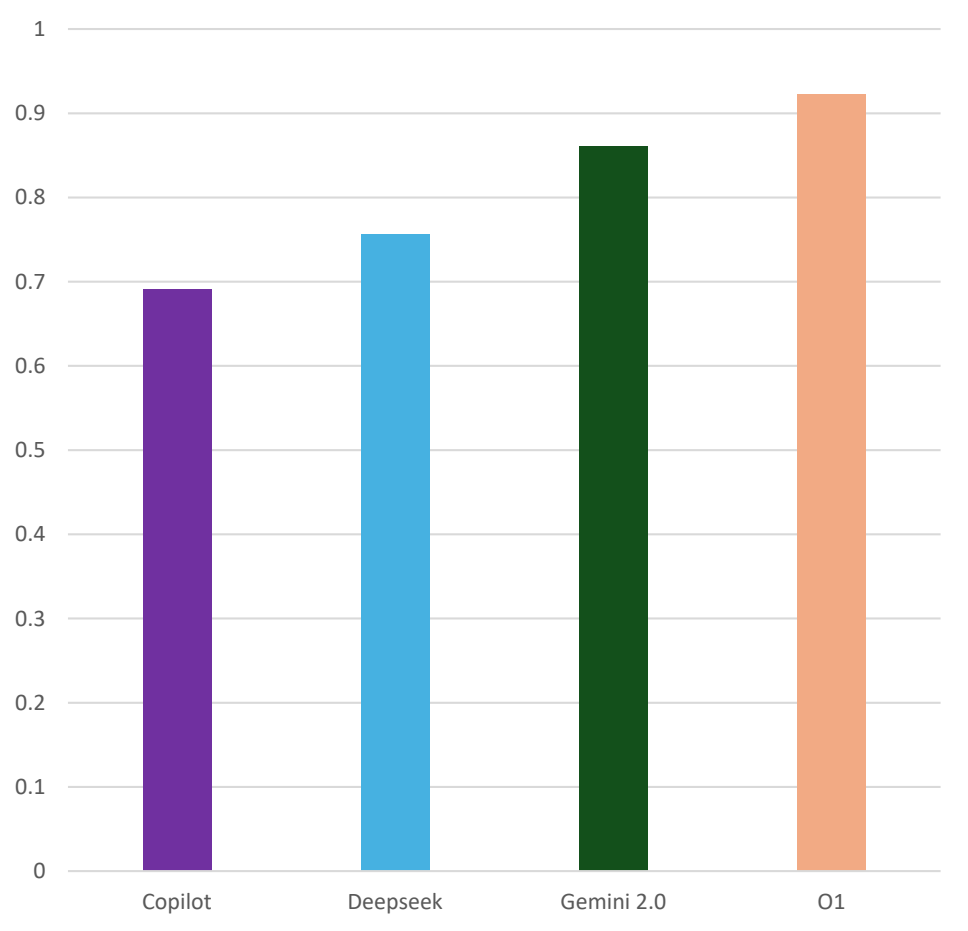


Figure 3. Mean proportion of guideline-recommended postoperative-complication instructions correctly included in clinic letters generated by four large-language-model platforms (Microsoft Copilot, DeepSeek, Gemini 2.0, GPT-4o "O1").

LLM	Mean (%)	Standard Deviation
Copilot	0.6908	0.13228
Deepseek	0.7558	0.14939
Gemini 2.0	0.8608	0.07937
O1	0.9225	0.10393

Table 5. Descriptive statistics for complication-counselling compliance.

LLM	LLM	Mean Difference	P Value
Copilot	Deepseek	-0.065	0.546
	Gemini 2.0	-.17000*	<0.05
	O1	-.23167*	<.001
Deepseek	Copilot	0.065	0.546
	Gemini 2.0	-0.105	0.152
	O1	-.16667*	<0.05
Gemini 2.0	Copilot	.17000*	<0.05
	Deepseek	0.105	0.152
	O1	-0.06167	0.589
O1	Copilot	.23167*	<.001
	Deepseek	.16667*	<0.05
	Gemini 2.0	0.06167	0.589

Table 6. Bonferroni-adjusted pair-wise comparisons among large-language-model outputs.

Discussion

Improved Understandability:

- Language Model-generated letters demonstrated consistently high performance on the PEMAT-P checklist, suggesting they produce clinic letters that patients are likely to find clearer and more actionable compared to traditional human-dictated letters.
- Gemini, DeepSeek and Copilot all produced more understandable letters (0.81-0.83) which was statistically significant ($p<0.05$).

Optimised Readability:

- LLM-generated letters consistently met target readability levels (Flesch-Kincaid, SMOG, Gunning-Fog) suited for patient comprehension, aligning with the reading age recommendations (11–12 years).
- In contrast, clinician-authored letters varied significantly, often exceeding optimal reading age and potentially limiting patient understanding.

Enhanced Complication Inclusion

- O1 had the greatest complication integration compliance (0.92) with copilot having lowest (0.76) ($P<0.001$)
- The standardisation provided by LLMs can potentially reduce clinical oversight risks, promoting safer, more thorough patient consent documentation.

Limitations and Future Directions

- Although promising, this proof-of-concept requires broader validation, particularly exploring patient satisfaction and real-world clinical outcomes.
- **Human in the loop approach:** Recording of clinical encounters and using Large language models to create a letter based on the consultation
- Prioritise high-volume arthroplasty lists (hip & knee replacements) where streamlined, standardised consent letters can save minutes per case and cut transcription backlog.

Conclusion

LLMs effectively enhance informed consent processes by consistently generating orthopaedic clinic letters that are clear, readable, and comprehensive in communicating risks and complications.

AI-driven documentation significantly reduces clerical workload, particularly valuable in high-volume procedures such as total hip and knee replacements, improving clinical efficiency and patient interaction quality.

Further rigorous research is necessary to explore patient perspectives, clinician acceptance, and real-world clinical outcomes to fully integrate LLM-generated documentation into routine orthopaedic practice.

Adopting LLM-generated clinic letters could set a new standard in patient-centred communication, aligning closely with clinical best practices and medico-legal requirements outlined by Montgomery vs. Lanarkshire.

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Heterotopic ossification after total hip arthroplasty:
Effect of pericapsular tranexamic acid and different closure techniques

Presenter- Anurag Singh

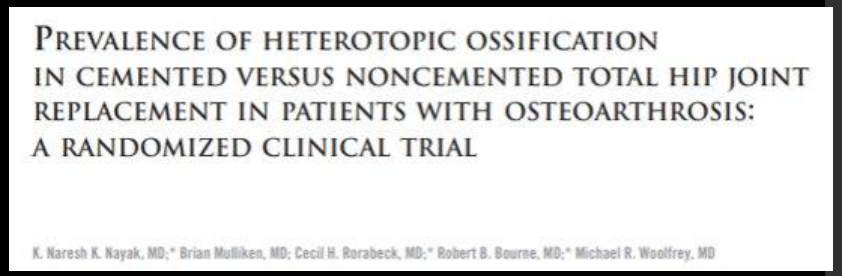
Co-authors- K Kannan, P Padhi, N Reddy, B Ramesh, R Madhusudhan

Glan Clwyd Hospital



Introduction

- One of the commonest complications
- Incidence- 15-90%
- Immune cell infiltration and excessive inflammatory reactions
- IL-6 and IL-1
- Hip stiffness
- Severe cases will need revision arthroplasty


PREVALENCE OF HETEROTOPIC OSSIFICATION IN CEMENTED VERSUS NONCEMENTED TOTAL HIP JOINT REPLACEMENT IN PATIENTS WITH OSTEOARTHROSIS: A RANDOMIZED CLINICAL TRIAL

K. Naresh K. Nayak, MD;* Brian Mulliken, MD; Cecil H. Rorabeck, MD;* Robert B. Bourne, MD;* Michael R. Woolfrey, MD


Heterotopic Ossification: A Challenging Complication of Total Hip Arthroplasty: Risk Factors, Diagnosis, Prophylaxis, and Treatment

Paweł Łęgosz, [1] Maciej Otworowski, [1] Aleksandra Sibilska, [2] Krzysztof Starszak, [1] Daniel Kotrych, [3] Adam Kwapisz, [2] and Marek Synder [2]


Heterotopic Ossification: A Comprehensive Review

Carolyn Meyers,[1*] Jeffrey Lisiecki,[2*] Sarah Miller,[1] Adam Levin,[3] Laura Fayad,[4] Catherine Ding,[5] Takashi Sono,[1] Edward McCarthy,[1] Benjamin Levi,[2] and Aaron W James[1,5]

Investigations

- X Rays
- Scintigraphy
- Brooker Classification

Grade	Description
I	Islands of bone in soft tissue
II	Bone spurs > 1 cm apart
III	Bone spurs < 1 cm apart
IV	Bony ankylosis


Heterotopic ossification following hip arthroplasty: a comparative radiographic study about its development with the use of three different kinds of implants

Carlo Biz[1*], Davide Pavan[1], Antonio Frizziero[2], Ala Baban[2] and Claudio Iacobellis[1]

Prophylaxis

- Radiotherapy- 7 Gy given postoperatively in a single dose
- NSAIDs- Indomethacin, ibuprofen and diclofenac
- Selective COX-2 Inhibitors- celecoxib, rofecoxib



Heterotopic Ossification Prophylaxis After Total Hip Arthroplasty: Randomized Trial of 400 vs 700 cGy

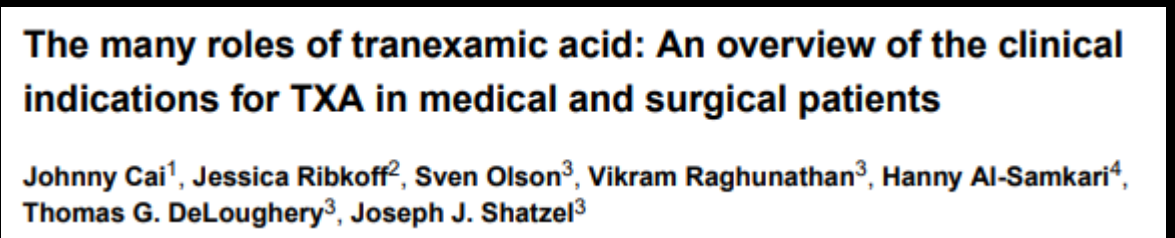
Jane Z. Liu, MD [a,*], Nicholas B. Frisch, MD, MBA [a], Regina M. Barden, RN, BSN, ONC [b], Aaron G. Rosenberg, MD, FACS [b], Craig D. Silverton, DO [a], Jorge O. Galante, MD [b]

Effect of a selective COX-2 inhibitor, celecoxib, on heterotopic ossification after total hip arthroplasty: a case-controlled study

Julius K. Oni[1], Joseph R. Pinero[2], Bryan M. Saltzman[3], Fredrick F. Jaffe[4]

Mechanism of action

- Tranexamic Acid (TxA) has Antifibrinolytic effects
- Half-life of two hours
- 90% excretion in 24 hours
- Reduce levels of CRP, IL-6, TNF-α, reactive oxygen species and MMP-9


The many roles of tranexamic acid: An overview of the clinical indications for TXA in medical and surgical patients

Johnny Cai[1], Jessica Ribkoff[2], Sven Olson[3], Vikram Raghunathan[3], Hanny Al-Samkari[4], Thomas G. DeLoughery[3], Joseph J. Shatzel[3]


Tranexamic acid adverse reactions: a brief summary for internists and emergency doctors

Giuseppe Murdaca[1]*, Monica Greco[1], Chiara Vassallo[1] and Sebastiano Gangemi[2]

AIM

- To identify effect of pericapsular tranexamic acid and different closure techniques in incidence of post operative heterotopic ossification after primary total hip replacement.

- Currently there are no studies demonstrating effect of local TXA on HO after THA

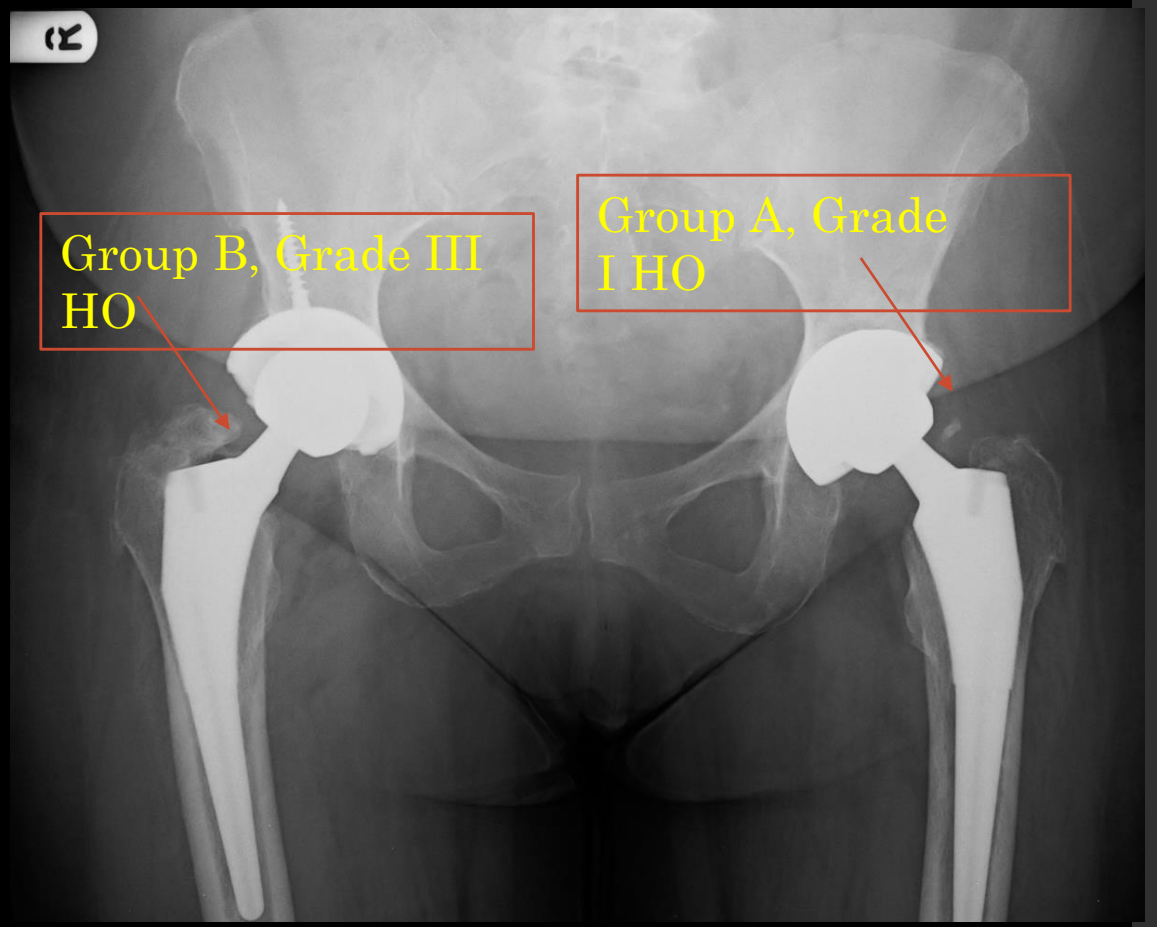
Methods

- Retrospective observational study in Glan Clwyd Hospital.
- 2018 to 2024
- All had I.V. Tranexamic Acid with NSAIDs post op
- Their immediate post op and 1 year follow up X rays were then evaluated.

Methods

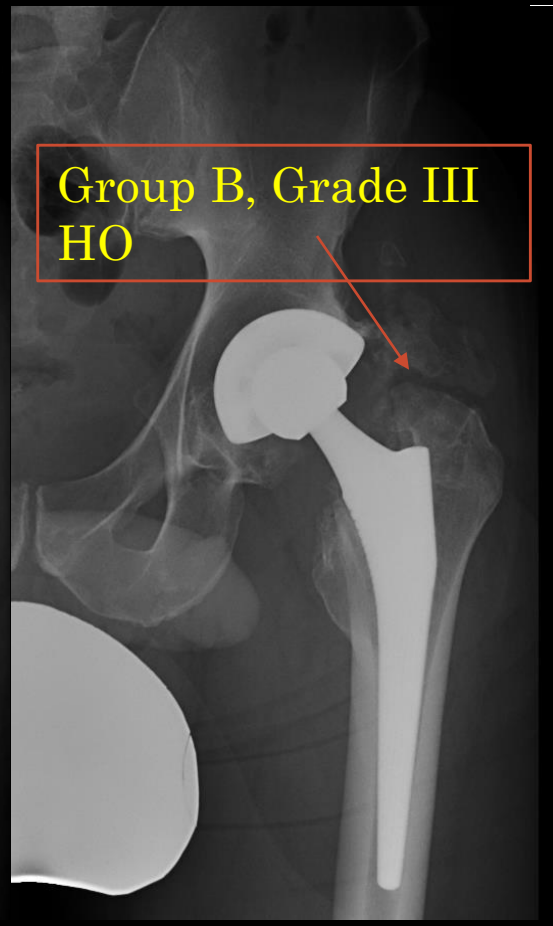
- Group A- Hardinge Approach with Pericapsular TxA and single layer abductor closure
- Group B- Hardinge Approach and abductors closed with PDS in single layer
- Group C- Hardinge Approach and multilayer abductor closure
- Group D- Posterior Approach

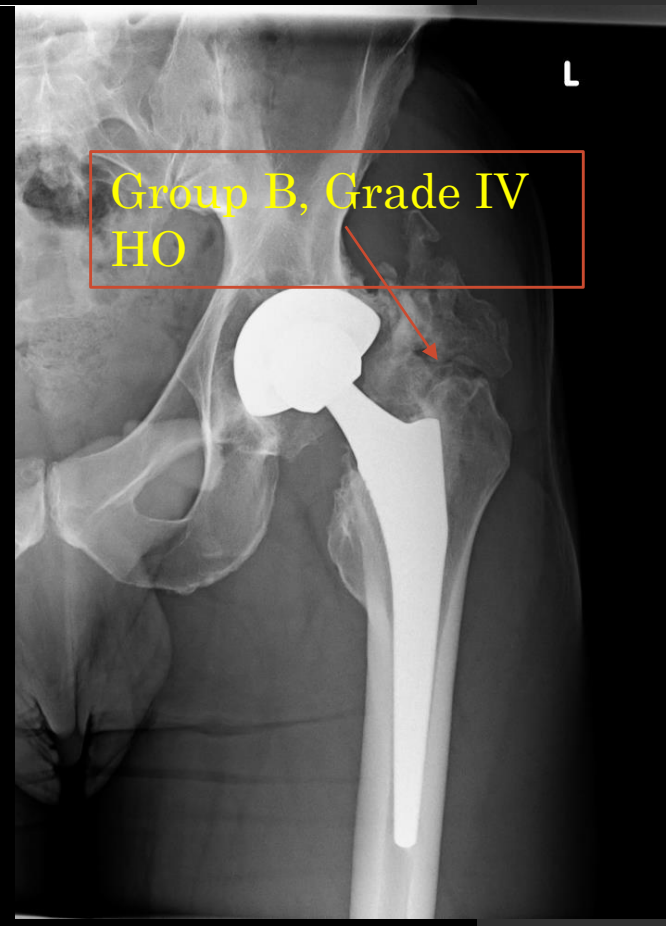

L


Group B, Grade III HO
Group A, Grade I HO

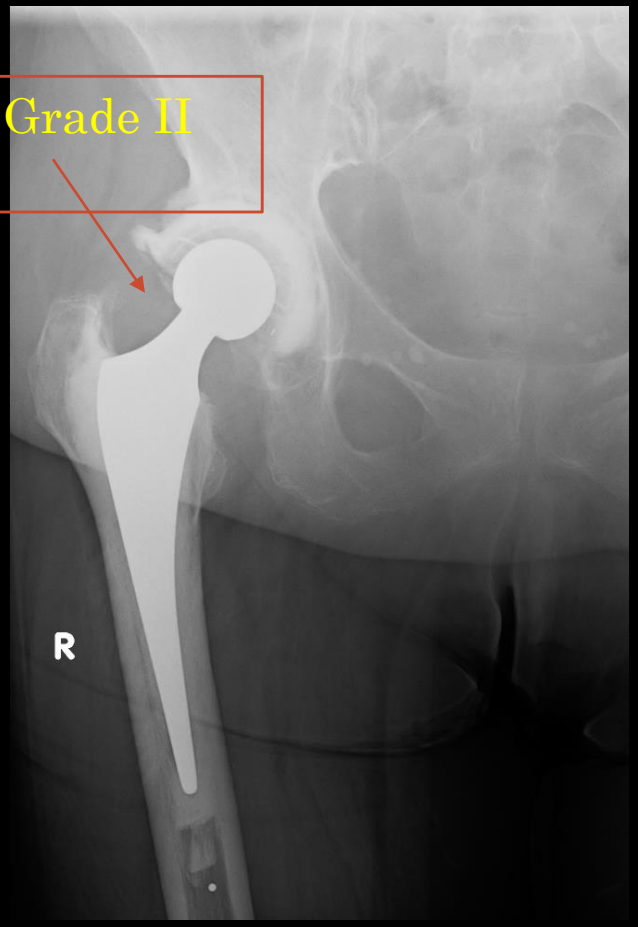


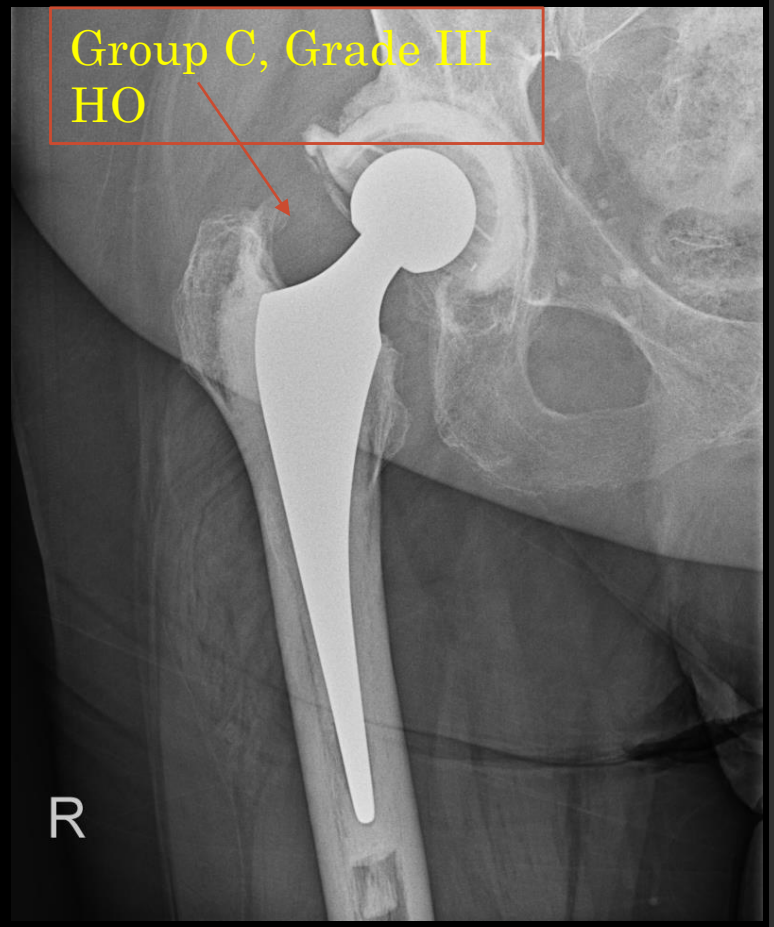

Group B, Grade II HO
L


Group B, Grade III HO


Group B, Grade IV HO
L



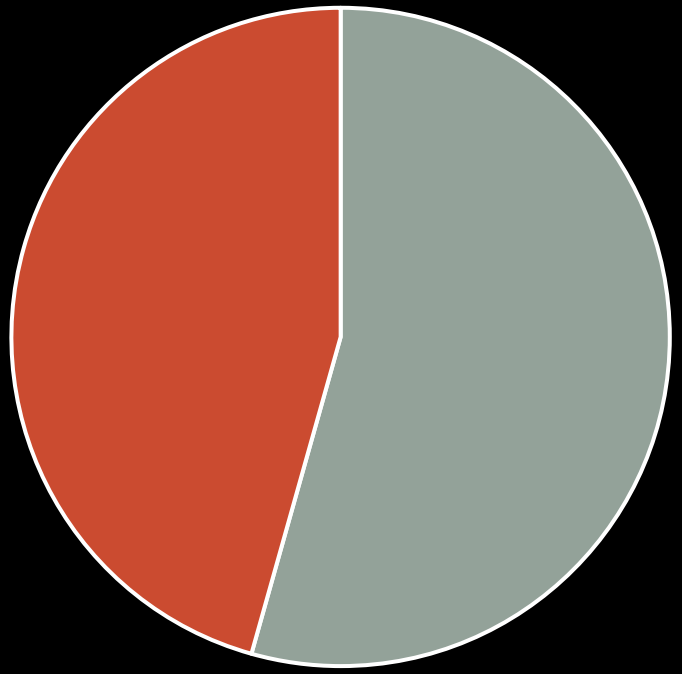

Group C, Grade II
HO
R


Group C, Grade III
HO
R

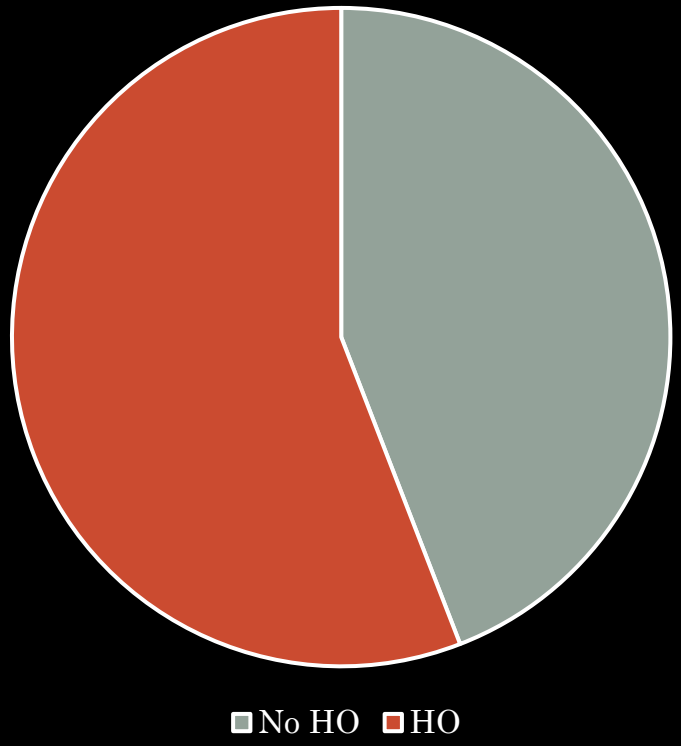
Results

	Group A	Group B	Group C	Group D
No HO	82.14 %	40.40 %	20 %	70 %
Grade I	12.5%	36.36 %	60 %	20 %
Grade II	3.57%	12.12 %	10 %	10 %
Grade III	1.78%	9.09 %	10 %	-
Grade IV	-	2.02 %	-	-
Total Patients	56	99	20	20

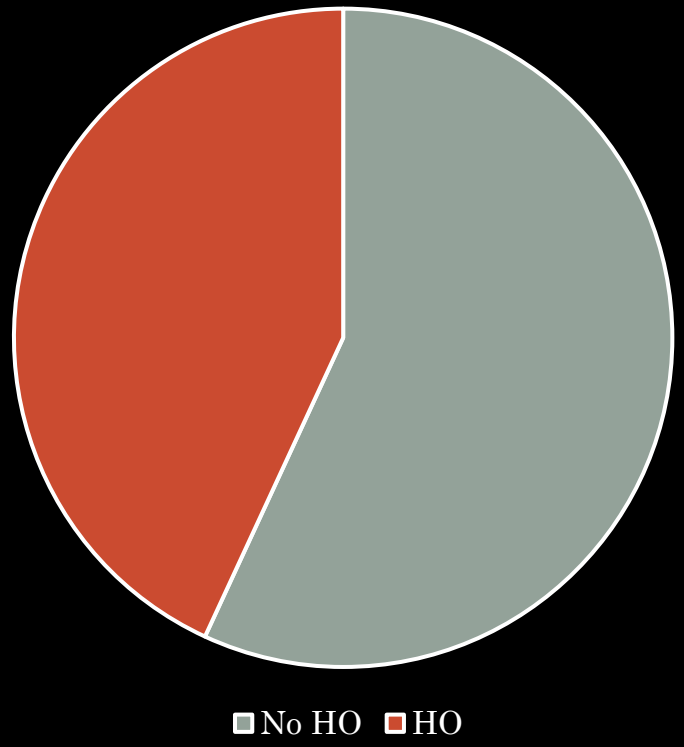
Uncemented THR



Cemented THR



Hybrid THR



Results

- Total 195 primary total hip replacements included
- 89.7 % had Modified Hardinge approach.
- Peri capsular infiltration of TxA during closure ($p<0.05$).
- Single layer closure ($p<0.05$).

Limitations

- Not matched for age, co-morbidities, Inflammatory arthritis
- Retrospective study
- Less sample size
- No clinical correlation with radiology

Conclusion

- Local infiltration of TXA and single layered closure of Abductors significantly reduces incidence of HO after THA with Modified Hardinge Approach.
- Need further prospective studies with a larger patient population for better evaluation

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A study of arthroplasty templating in one hospital: reviewing radiograph quality and accuracy

C Woodward, A Altahir, A Hussein



Introduction

- Templating is an important part of pre op planning for THR
- Helps to improve accuracy of THR, and save time with implant selection
- Only as accurate as information provided
- An adequate x ray depends on
  - Scaling ball
  - Sufficient proximal femur
  - Up to date

Introduction

- Templating recommended standard practice

- GIRFT / BHS

Best Practice for Hip Arthroplasty Surgery Documentation

GIRFT
GETTING IT RIGHT FIRST TIME

BRITISH HIP SOCIETY

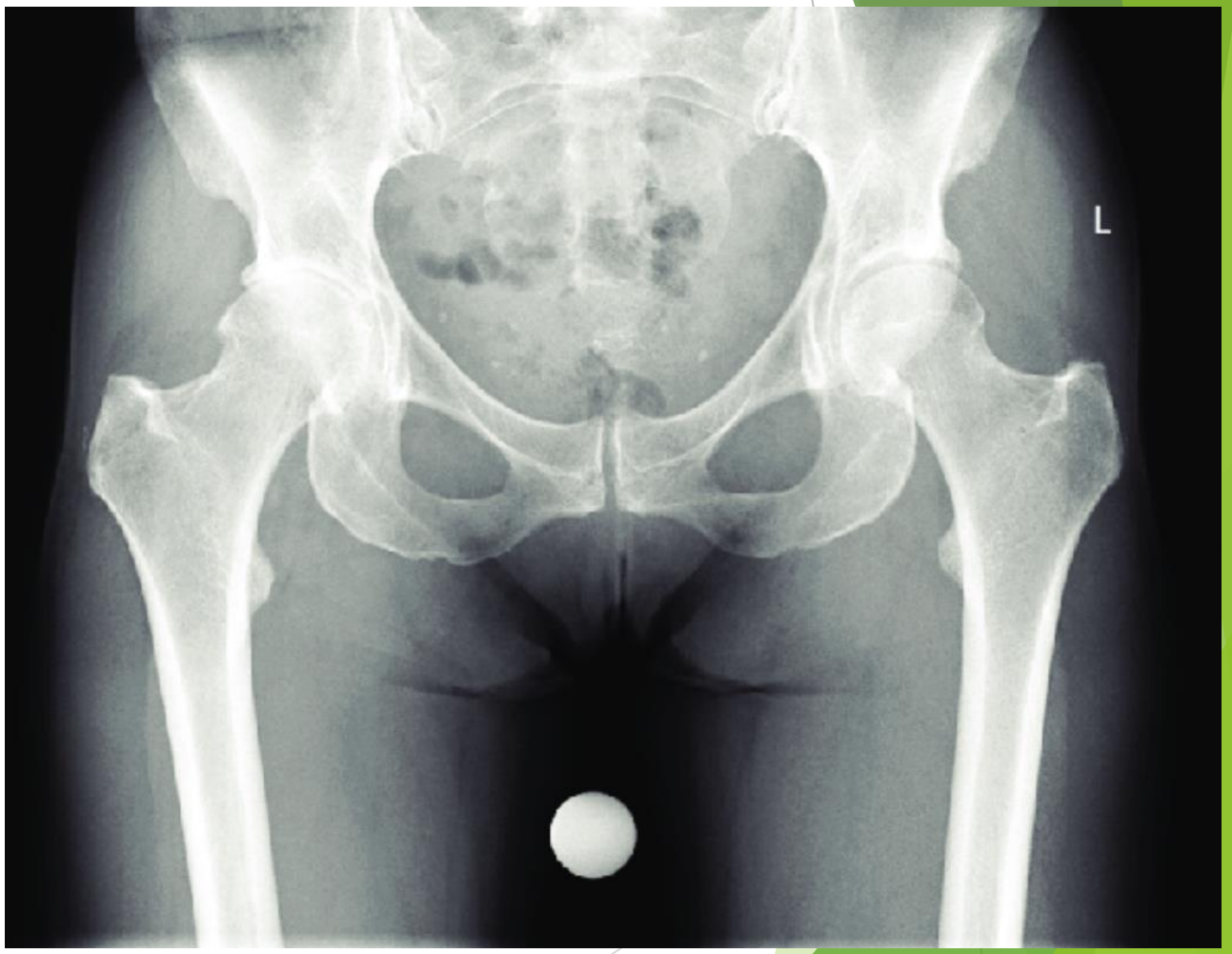
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Pre-operative planning

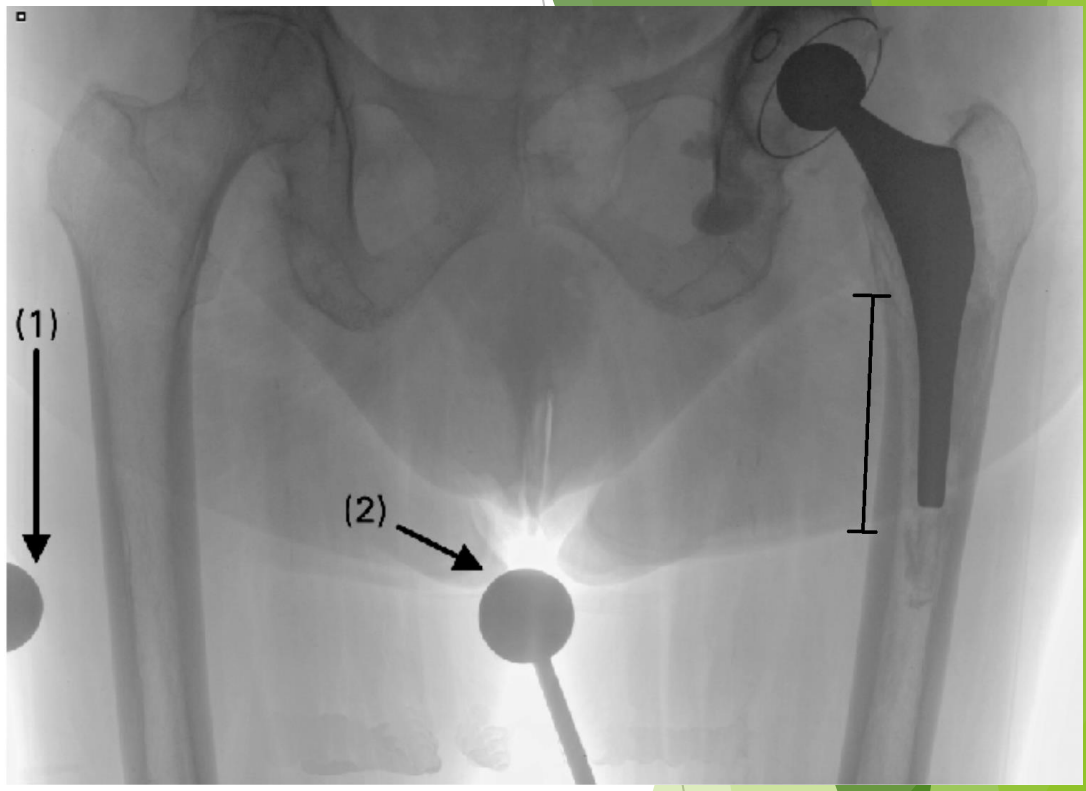
A record detailing the conclusions of any pre-operative multi-disciplinary team (MDT) meetings should be documented and thereafter made available to justify the indications for surgery and the procedure planned. In addition, the results of preoperative templating, if used, should be noted. A record of implant selection and rationale for that implant choice should be documented at the time of consent. Any potential bone grafting, whether autologous or non-autologous, should be discussed in the consent process and specifically referenced in the record of consent.

Methods – An adequate x ray

- We set out to asses the accuracy of local templating –
- Scaling ball - Present
- Sufficient proximal femur – could a stem be fully templated
- Up to date - performed within 6 months of surgery
- Aimed to analyse at least the last 100 THRs (NPT / MH)

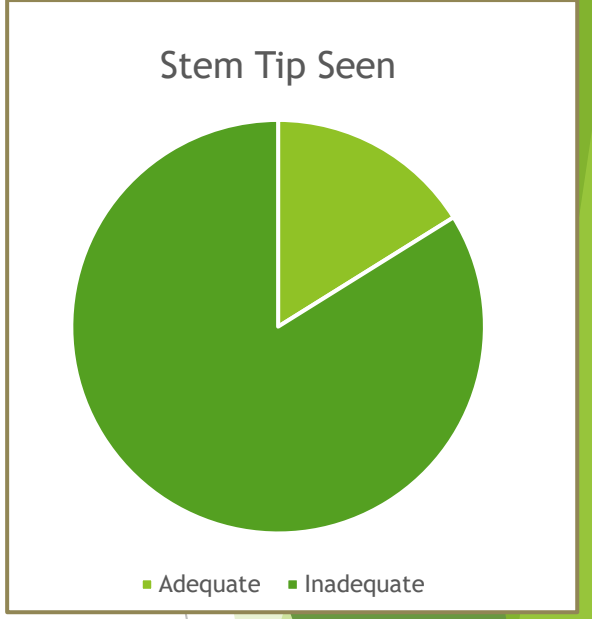


Results - Initial



- Looked at last **101 THRs** June –Nov 2023
- 7 consultants
- **61%** template saved
- **96 %** had a radiograph within 6 months of surgery
- **39%** had a scaling ball present
- Apparent average size of scaling ball 32.3 mm (magnified 1.3x)
- Average of **68mm** visible below lesser trochanter

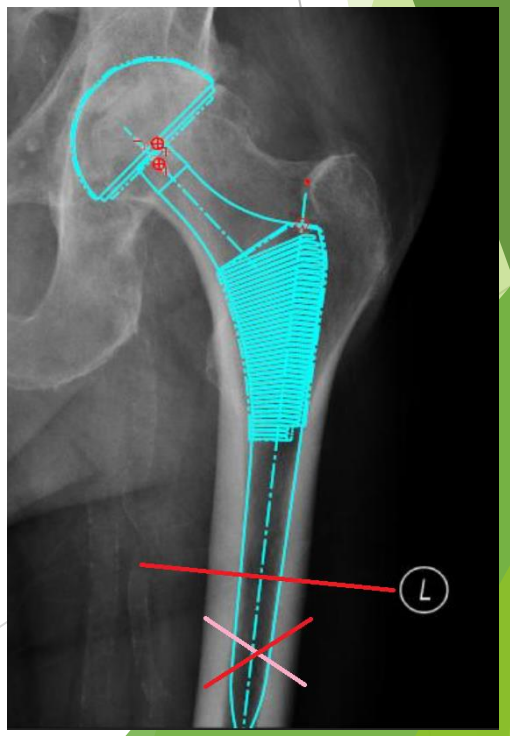
Results - Templating Accuracy



- 10 x rays were able to show templated stem tip
- 68mm below lesser trochanter evident on average
- **18 templated stems and 15 cups exactlymatched what was implanted**

Ie 29% and 24%

- Average cup discrepancy **2.6mm** (1.02x templated)
- Average stem discrepancy was **one size**



Discussion

- X rays performed close enough to surgery
- Majority have a saved template (more may actually be templated, or templated not using software)
- **Quality of templating x rays variable**– not scalable, inaccuracy of scaling, not enough femur included
- **Reduces usefulness and accuracy of templates**
- Surgeons may use/ interpret templates differently (guide, to think about planning, so wouldn't expect accuracy etc)
- **Many templates may have been done by juniors learning so may be inaccurate in any case**

Discussion - Accuracy

- Templating within one size still useful guide
- Consistent with other studies in this area

Cureus. 2023 Aug 6;15(8):e43046. doi: 10.7759/cureus.43046. eCollection 2023 Aug.

The Accuracy of Digital Preoperative Templating in Primary Total Hip Replacements

Sameh F Girgis [1], Suraj Kohli [2], Georgios Kouklidis [1], Abdelfatah M Elsenosy [1], Omer Ahmed [1], Lawrence O'Hara [1], Michael Kent [1], Bassem Michael [1], Nedal Zeineh [1]

The templated size corresponded to the actual femoral implant used in approximately 65.2% of cases. When femoral prostheses within one size above or below the templated size were included,the accuracy of preoperative templating rose to 97.2%. Regarding the uncemented acetabular component, the templated size corresponded to the actual acetabular implant used in 46.3% of cases.

Discussion

- Scaling ball position can lead to significant variation in magnification estimates
- Further data gathering may be useful to ensure a central scaling ball
- If inadequate scaling ball may be more useful to use a set magnification

› Cureus. 2023 Feb 12;15(2):e34883. doi: 10.7759/cureus.34883. eCollection 2023 Feb.

Accuracy of Total Hip Arthroplasty Templating Using Set Calibration Magnifications

Benjamin Schapira [1], Suroosh Madanipour [2], Farhad Iranpour [1], Padmanabhan Subramanian [1]

within two cup sizes (p=0.58). *Conclusion.* Templating acetabular cups using a set magnification of 118% or 119% yields accurate results and provides a reliable method to template without calibration equipment. Whilst BMI can affect magnification error, this has no significant effect on the accuracy of mplanted cups and stems within two sizes.

Discussion and Recommendations

- Encourage **precise wording of x ray forms** to ensure satisfactory x ray – AP Pelvis and both hips/femur, central scaling ball, for THR planning
- X Ray **protocol for THR planning**
- **Teaching for juniors on templating** – potentially useful for hemiarthroplasty also
- Something that should be considered for wider data gathering and local audit

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The Potential for Mesenchymal Stem Cells to Improve Outcomes in Autologous Chondrocyte Implantation.

Arwel T Poacher

[1]Cardiff Medical School, Cardiff, Wales

Background:

- Autologous Chondrocyte Implantation is the current gold standard of treatment for traumatic cartilage defects (Nawas *et al*. 2014)
- Significant limitations exist for this therapy.
- MSCs e.g. Cartilage derived Stem-cells (CPCs) are a potential alternative to chondrocytes (Jiang and Tuan 2015)

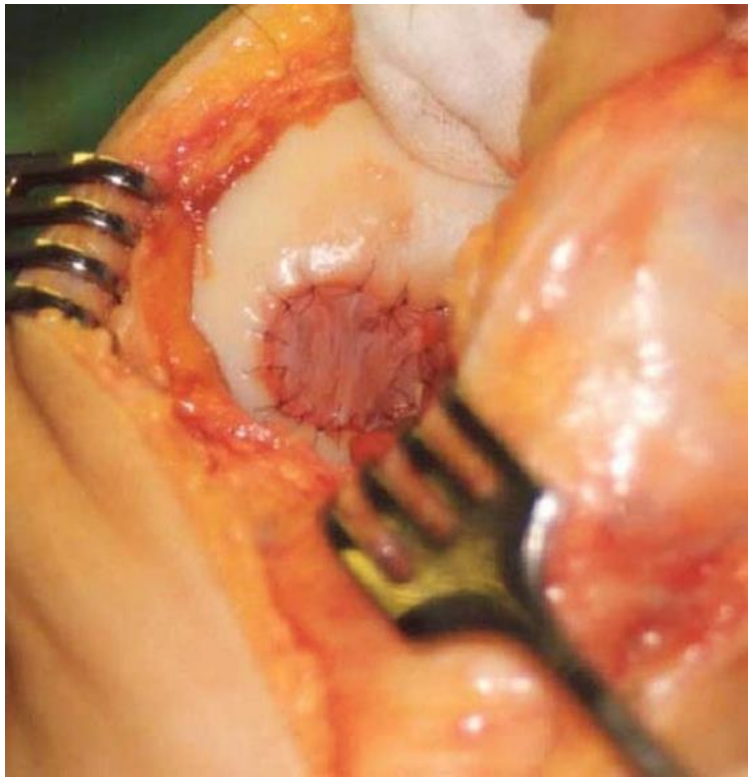


Figure 1. **Surgical photo of ACI repair**. Adapted from Mithoefer *et al*. (2012)

Aim:

- **To compare the properties of CPCs and chondrocytes in an in-vitro model of ACI.**

Methods:

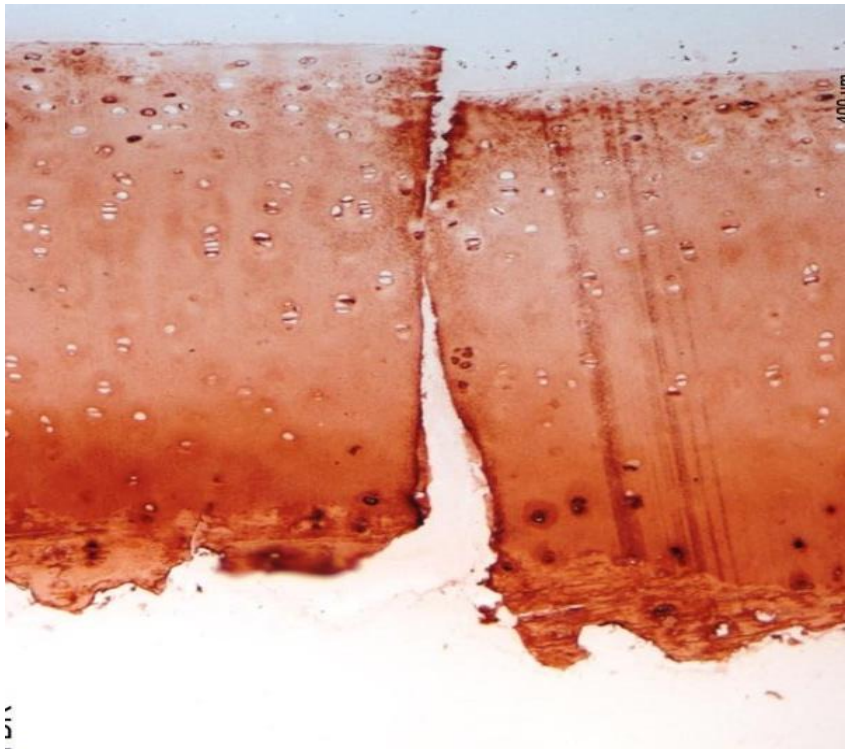
1) Disc ring formation
2) Investigation

Methods: Overview

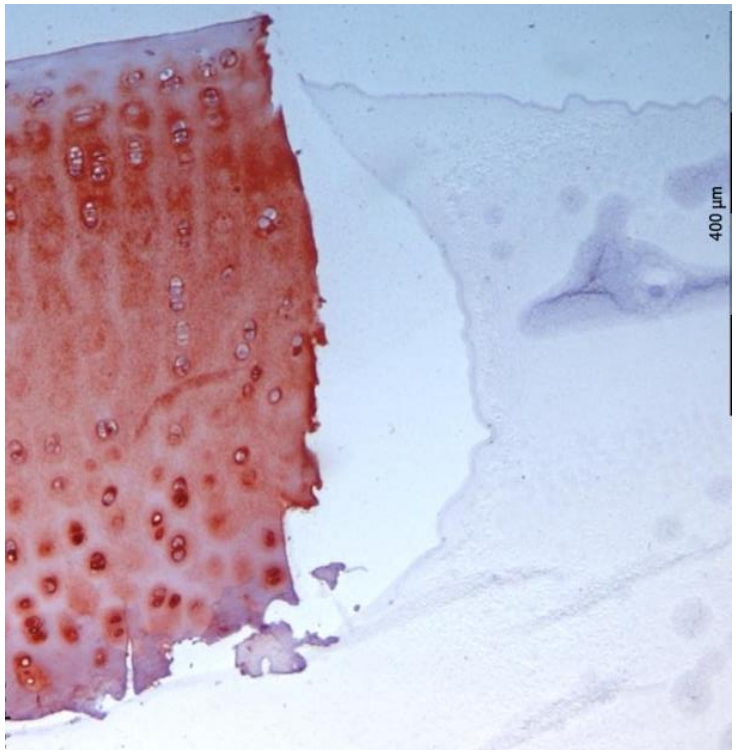
1) Disc ring formation
2) Investigation
   I. Integration: Histological (Toluidine blue) and Immunohistochemical (2B6 antibody) staining
   II. sGAG quantified with DMMB assay
   III. Collagen content of disc ring: Picrosirius red fluorescence (Wegner et al. 2017)

Results: CPCs vs chondrocytes (2B6 antibody)

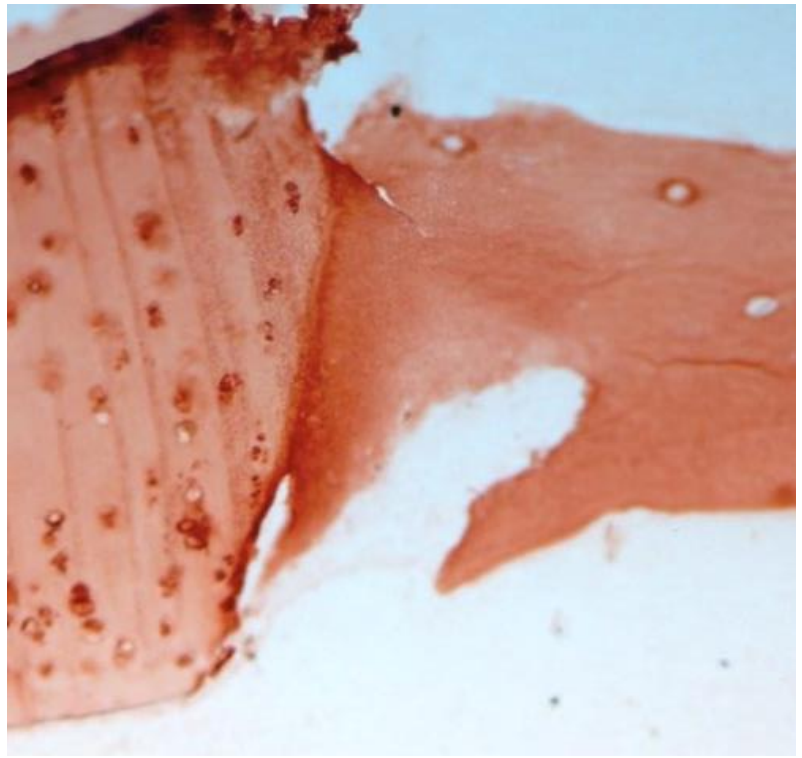
Cartilage (control)



Chondrocyte seeded agarose



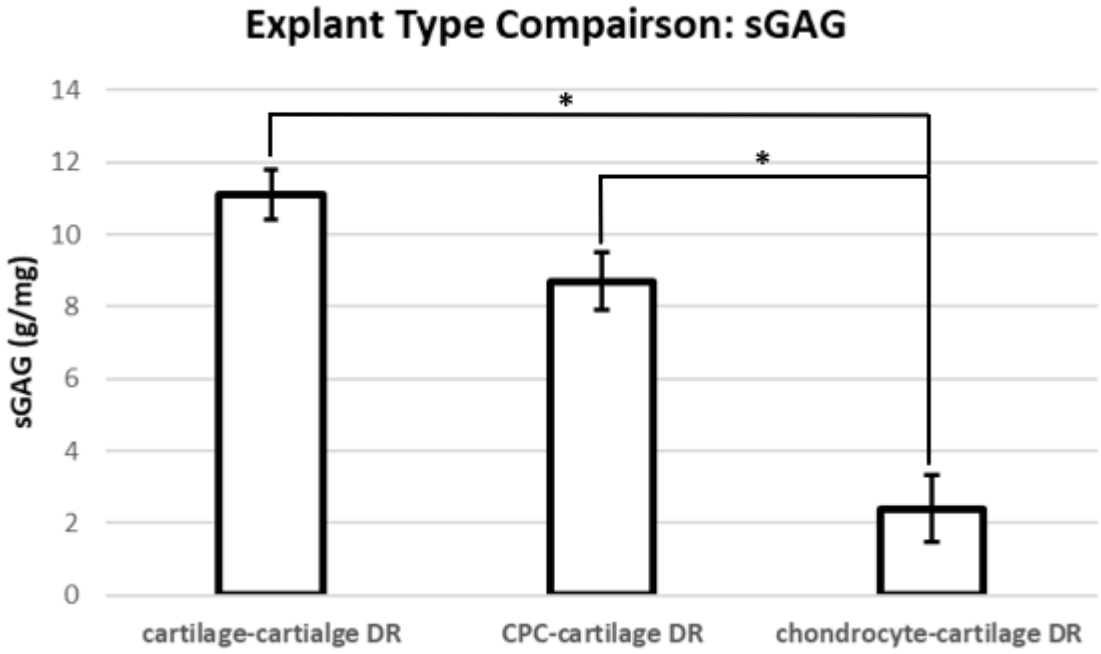
CPC seeded agarose



Results: sGAG production (DMMB assay)

Effect of explant type:

- Cartilage and CPC containing DR produced a similar level of GAG
- Significantly more than chondrocytes DR's

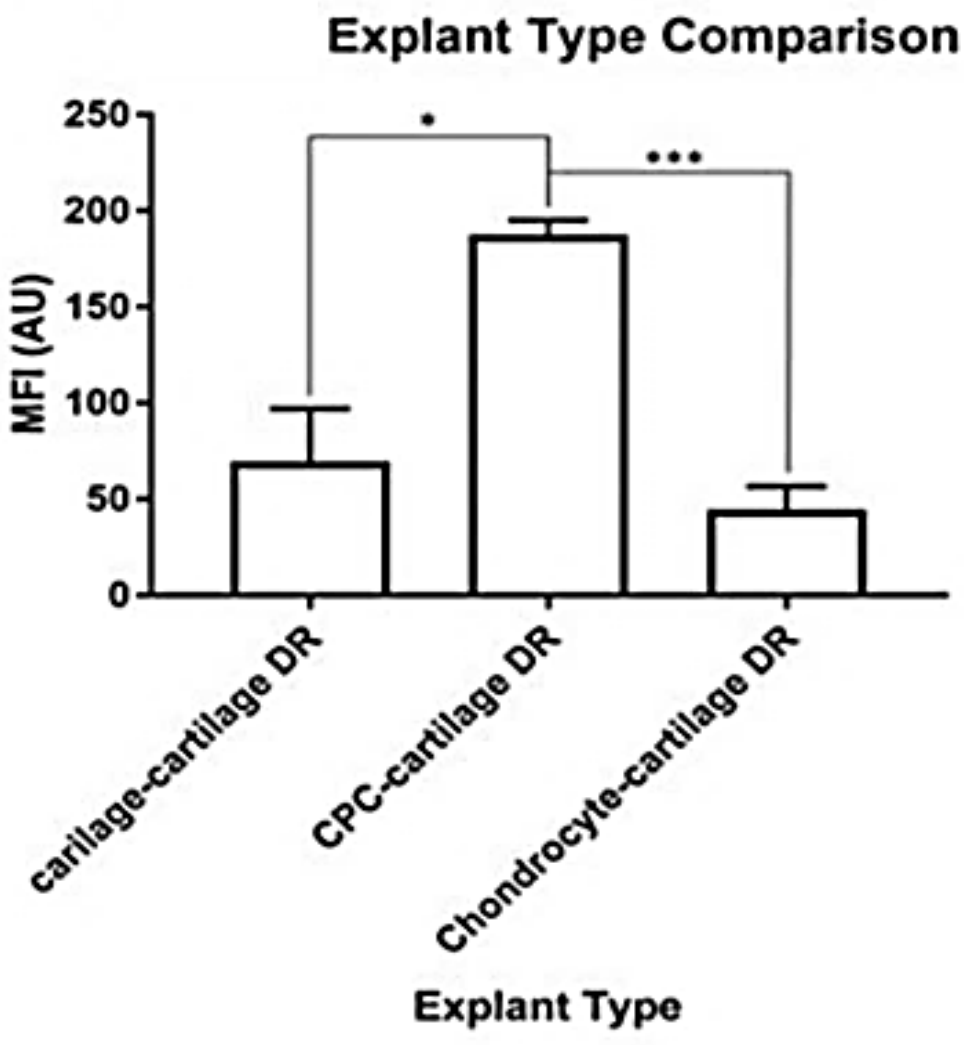


*P<0.05,

Results: collagen content (Picrosirius Red Fluorescence)

Effect of explant type:

- Presence of CPCs appeared to significantly increase collagen content



*P<0.05,
***P<0.0001

Conclusions:

1. CPCs demonstrated improved matrix production and integration
2. CPCs my have superior healing potential compared to chondrocytes
3. The use of CPCs in ACI therapy shows efficacy for reducing the significant limitations of therapy

Future directions: Further in-vitro investigation and in vivo analysis of MSCs in models of ACI therapy

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Thank you for listening!

Are there any questions?

Conflict of Interest: NONE

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Routine post operative blood tests in healthy patients undergoing hip and knee arthroplasty: Do they influence the post operative management? A Single-Centre Retrospective Analysis

Reuben Johnson
Inderpal Samra
Nischay Keshava
Amit Yadav
Janam Merchant
Sunil Panchani



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Introduction

- Increased demand for elective joint arthroplasty and bed pressures place significant financial burden on the health service
- Recent emphasis on optimizing patient flow and reducing length of stay to help ease pressures
- Routine postoperative bloods have become the ‘norm’.
- Most enhanced recovery pathways still include routine blood testing.
- Emerging evidence has demonstrated that routine tests may not be required and rarely influence management.

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Literature

Study	Year	Patients	Outcomes
Garg et al[1]	2020	353 THR patients	No patients aged <70 ASA1 & 2 required transfusion or electrolyte correction
Hennessy et al[2]	2020	136 TKR, THR	3.7% required transfusion
Halawi et al[3]	2018	319 TKR	3.8% AKI and 1% transfusion
Li et al[4]	2022	713 UKR patients	90% of abnormal tests did not require intervention
Naathan et al[4]	2023	1402 TKR and THR	2.6% treatment for hyponatraemia, 0.014% blood transfusion

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Aims

1. To assess the need for routine post op blood testing in ASA 1 & 2 patients undergoing primary hip and knee arthroplasty.
2. To identify the risk factors that influence postoperative blood results.
3. To assess the intervention rate based on the post op blood results.

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Methodology

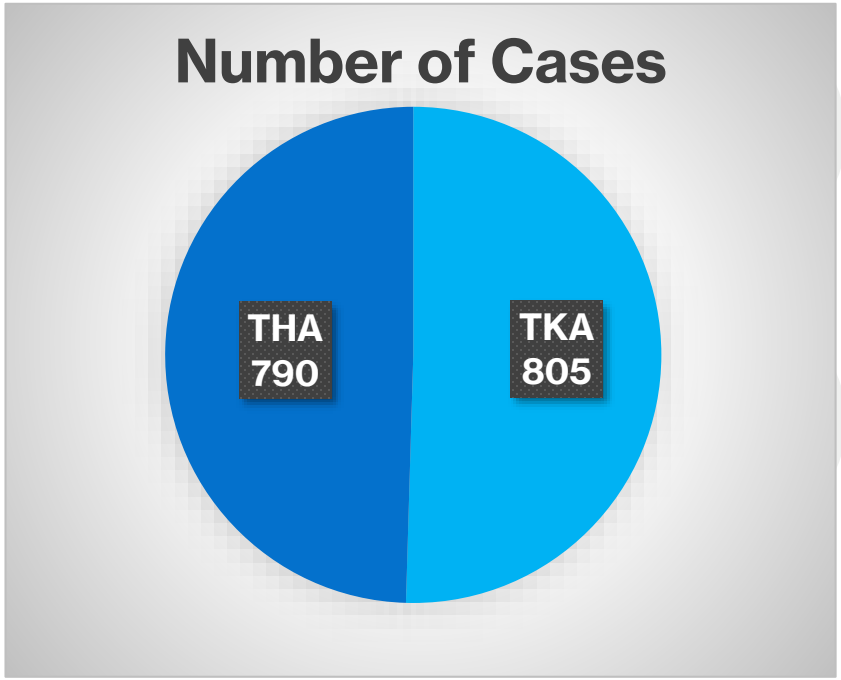
- Retrospective study
- **Inclusion Criteria** - **ASA 1 & 2** patients at Wrightington Hospital undergoing elective hip and knee arthroplasty in 2022.
- Preoperative and postoperative blood results were analysed and compared.
- Blood abnormalities, complications and intervention performed were considered as primary outcome measures

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Results

- **1595** sequential ASA 1 & ASA 2 primary arthroplasty patients (790 THA, 805 TKA)

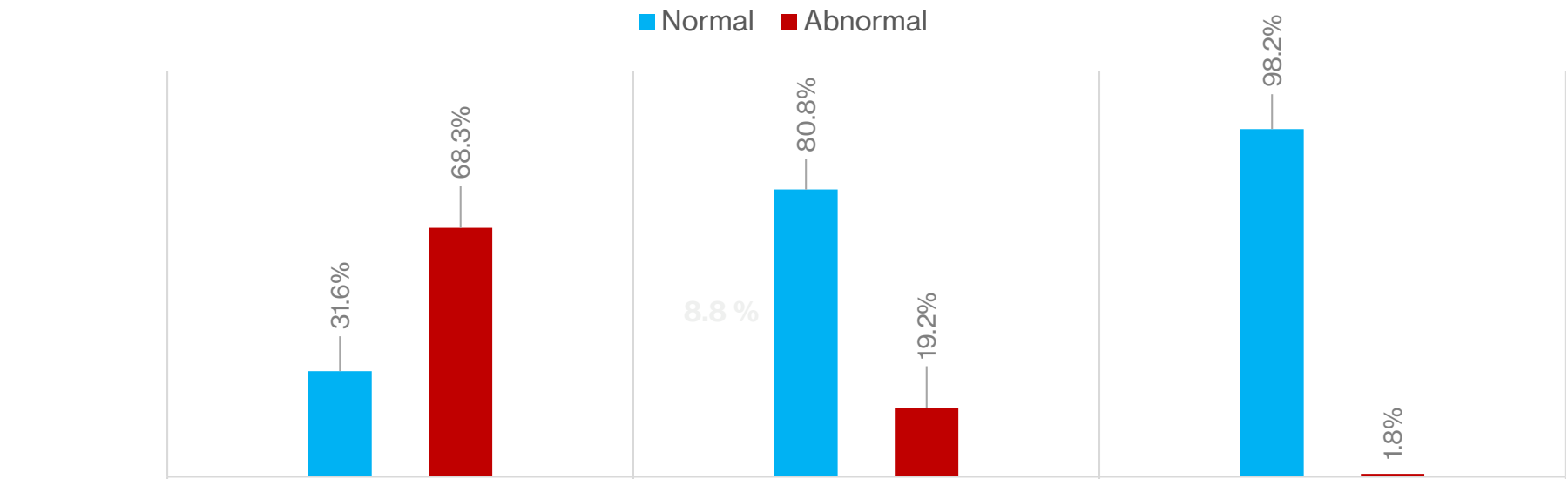
	THA	TKA
Age (years)	64.8 +/- 8.5	67.9 +/- 12.5
Males	305 (38.7%)	376 (46.7%)
Females	485 (61.3%)	429 (53.3%)
ASA 1	95 (12%)	69 (8.5%)
ASA 2	695 (88%)	736 (91%)
BMI	28.5 +/- 9.2	30.9 +/- 10.3
Surgical Time (mins)	87.6 +/- 28.0	75.1 +/- 23.5
LOS (days)	3.83 +/- 1.78	3.36 +/- 3.58



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Results

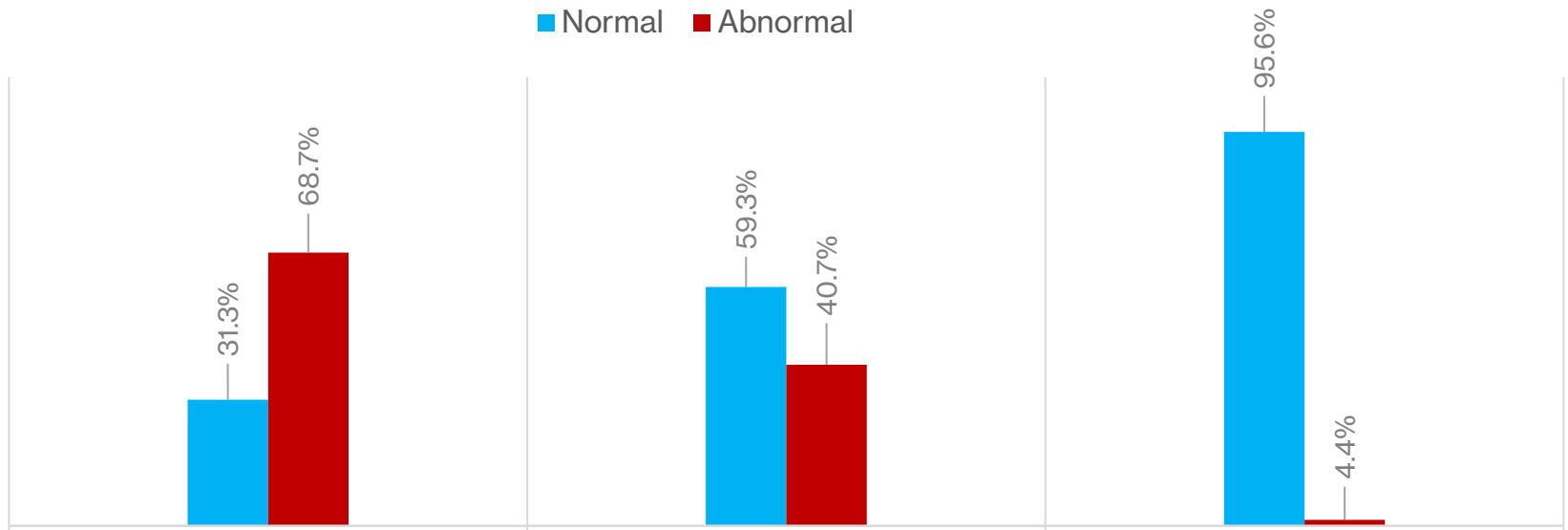
POST OPERATIVE BLOOD DERANGEMENTS – THA



	Hb	Sodium	Potassium
Normal	234	637	771
Abnormal	552	152	6

Results

POST OPERATIVE BLOOD DERANGEMENTS – TKA



	Hb	Na	K
Normal	253	479	790
Abnormal	548	323	12

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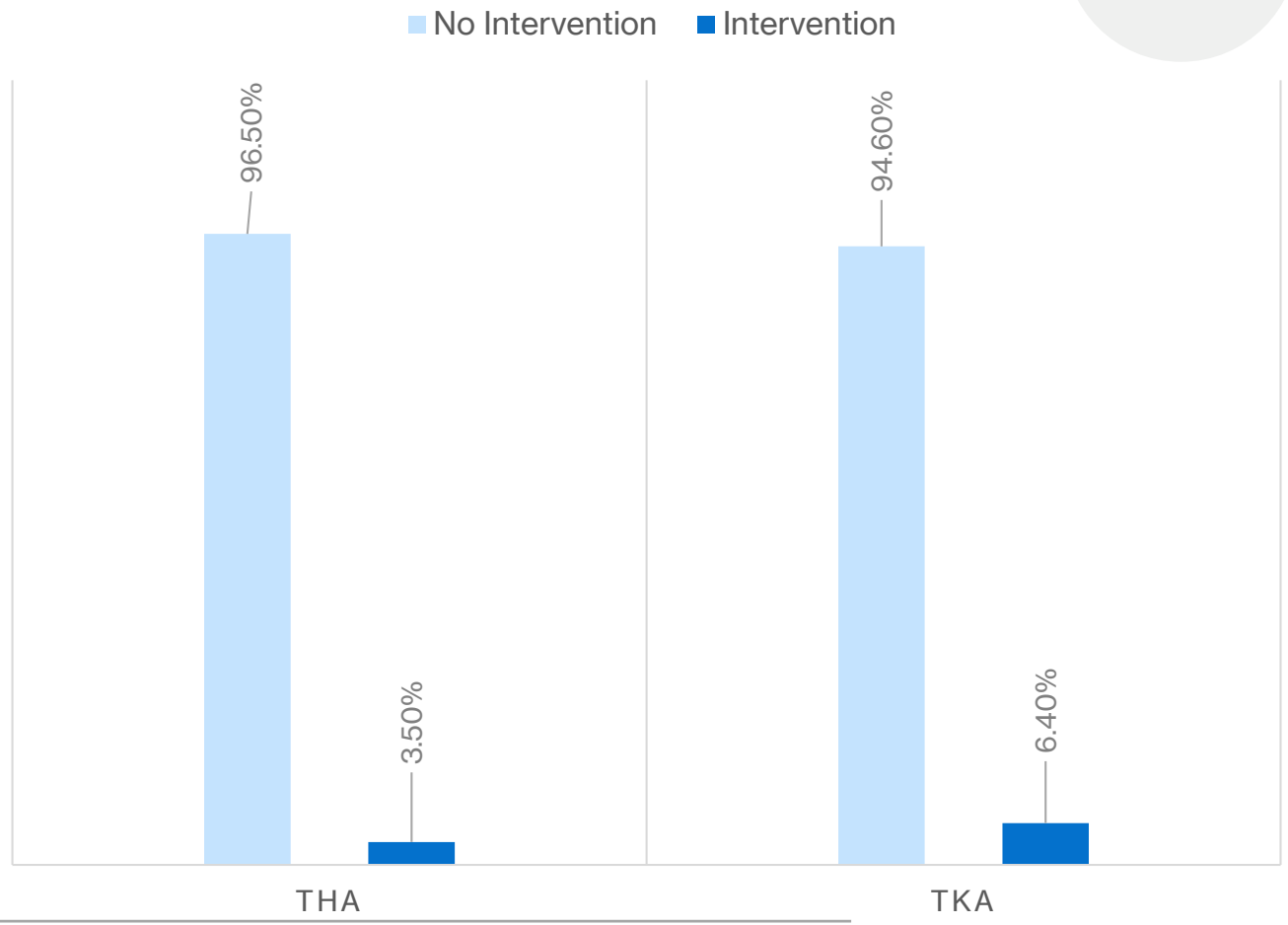
Hyponatremia	THA (152)	TKA (323)
Mild (130-134)	135 (88.8%)	300 (92.9%)
Moderate (125-129)	13 (8.6%)	15 (4.6%)
Severe (<125)	4 (2.6%)	8 (2.5%)

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Post Op Bloods Intervention

- **THA**
- 28 patients (3.5%) required interventions post op.

- **TKA**
- 52 patients (6.4%) required interventions post op.



INTERVENTIONS

INTERVENTIONS	THA 28(3.5%)	TKA 52(6.4%)
Blood Transfusion	6	4
Fluid restriction	12	30
IV fluids	2	8
IV Iron	2	1
Oral Na supp	1	3
Oral K supp	4	3
Oral Mg supp	3	2
Oral Iron supp	1	1

Risk Factors Associated with Postoperative Moderate to Severe Anaemia

Factor	*Adjusted Odds Ratio (95% C.I.)*	p value
Age	1.00 (0.99-1.01)	0.704
BMI	1.06 (1.03-1.08)	<0.0001*
Surgical Time	0.99 (0.98-1.00)	0.002*
Preoperative Clopidogrel	3.87 (1.14-13.16)	0.027*
Preoperative Aspirin	2.38 (1.21-4.71)	0.011*
Preoperative DOAC	0.58 (0.30-1.13)	0.10
Preoperative Warfarin	2.15 (0.61-7.58)	0.24
NSAID use	1.66 (0.57-4.85)	0.35
Renal Disease	0.78 (0.18-3.33)	0.73
Chronic Inflammatory Arthritis	0.65 (0.20-2.05)	0.46
Preoperative Haemoglobin	1.11 (1.09-1.12)	<0.0001*
Preoperative Platelet Count	1.00 (0.99-1.00)	0.24

Risk Factors Associated with Postoperative Moderate to Severe Hyponatraemia

Factor	*Adjusted Odds Ratio (95% C.I.)*	p value
Age	0.98 (0.96-0.99)	<0.0001*
BMI	1.00 (0.98-1.01)	0.42
Surgical Time	1.00 (0.99-1.01)	0.31
Renal Disease	0.51 (0.14-1.93)	0.32
Hypothyroidism	1.01 (0.64-1.58)	0.97
NSAID use	2.80 (0.77-10.18)	0.12
PPI use	1.66 (1.19-2.31)	0.003*
Anti-depressant use	1.89 (0.81-4.42)	0.14
ACEi use	1.08 (0.78-1.50)	0.66
Loop Diuretic use	8.28 (1.05-65.3)	0.045*
Thiazide Diuretic use	0.94 (0.57-1.56)	0.81
Preoperative Sodium	1.25 (1.19-1.30)	<0.0001*

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Conclusion

- Post operative anemia and hyponatremia were the most common blood abnormalities.

- Risk factors identified for post operative anemia were pre-operative anaemia, anti platelet medications, high BMI and duration of the surgery.

- Risk factors identified for post operative hyponatremia were age >70 , pre-operative hyponatremia, pre-existing renal disease, patients on loop diuretics and proton pump inhibitors.

- Majority of the post op blood results in ASA 1 & 2 showed only mild abnormalities.
- The overall rate of intervention rate <5%.

- Findings question the routine need for post op blood tests in ASA 1 patients undergoing elective hip and knee arthroplasty.
- Individualised testing in ASA 2 patients with identified risk factors could potentially be adopted in patients safely.
- This could potentially benefit significant cost savings and reduce the length of stay.

Disclaimer/Conflict of Interest

- No Conflict of Interest

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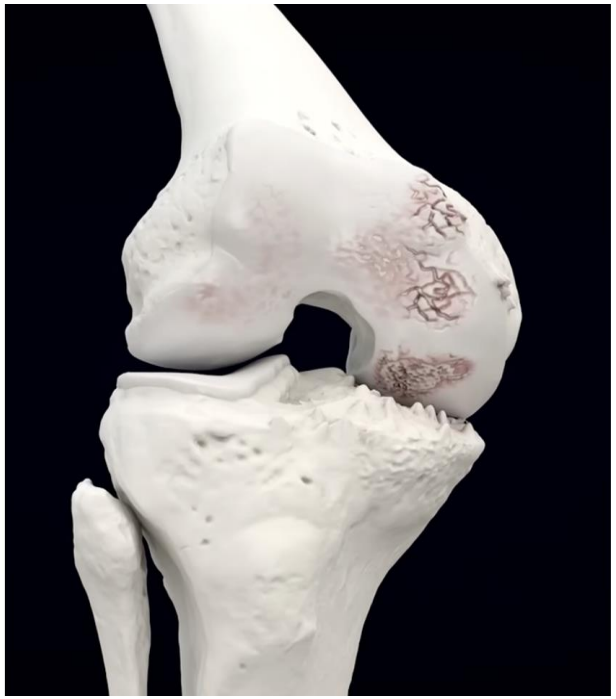
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What is iPAAG?

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VISCOELASTIC

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Structural stability of hydrogel provides longevity of action.[11]

OUS/ARTHRO/JUL2022/097

Providing long-term relief from pain, the iPAAG has been used for other indications with long-term follow up of 10 years with no migration.[15]

Researched for more than two decades,[11] this hydrogel has been proven to be safe and effective with more than:

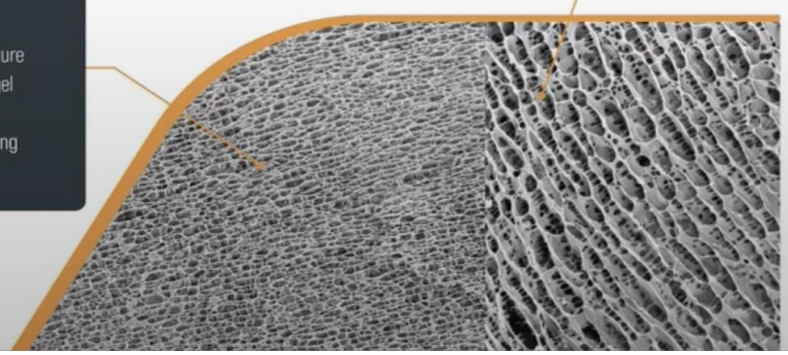
705,000
units of Aquamid® or Aquamid® Reconstruction[11]

100,000
units of Arthramid® Vet[11]

280,000
units of Bulkamid®[11]

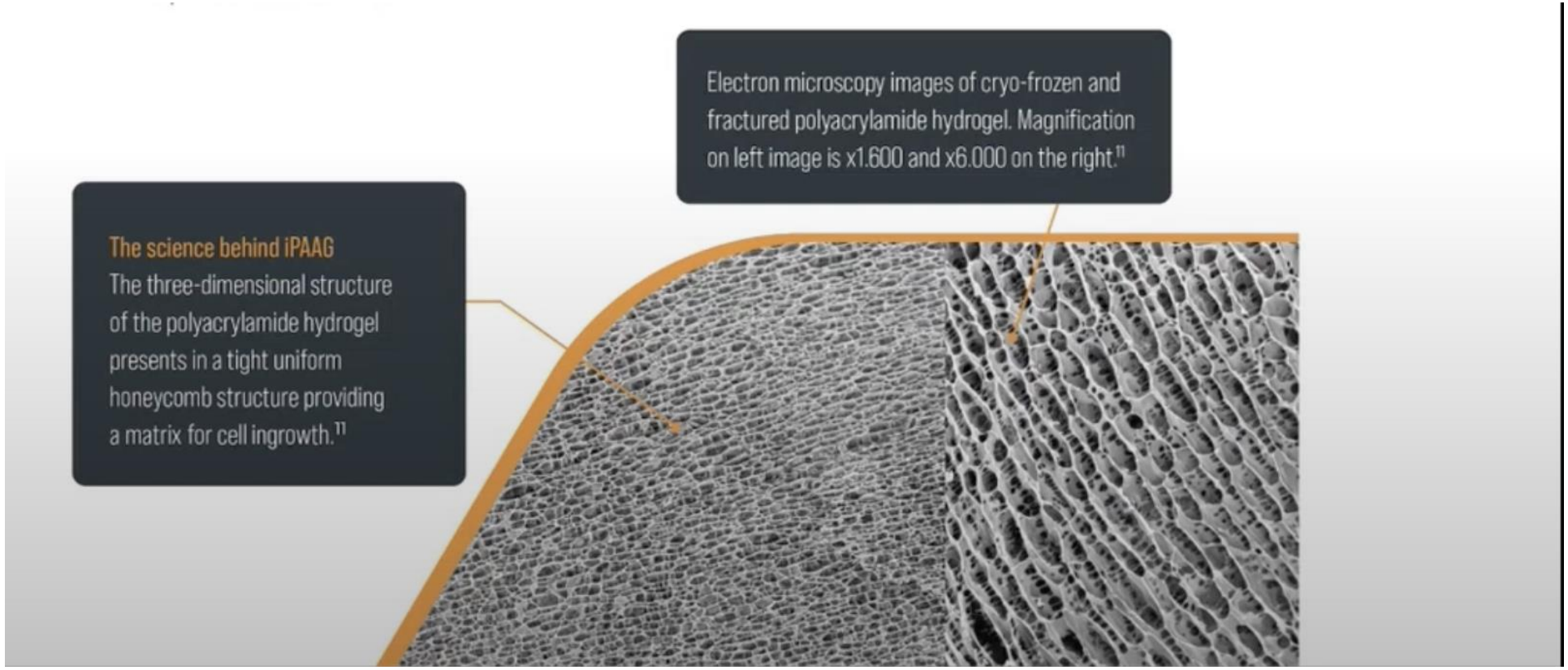
The science behind iPAAG
The three-dimensional structure of the polyacrylamide hydrogel presents in a tight uniform honeycomb structure providing a matrix for cell ingrowth.[11]

Electron microscopy images of cryo-frozen and fractured polyacrylamide hydrogel. Magnification on left image is x1.600 and x6.000 on the right.[11]



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Why This Matters?



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What is Arthrosamid?



705,000

units of Aquamid® or Aquamid® Reconstruction[11]



100,000

units of Arthramid® Vet[11]



280,000

units of Bulkamid®[11]

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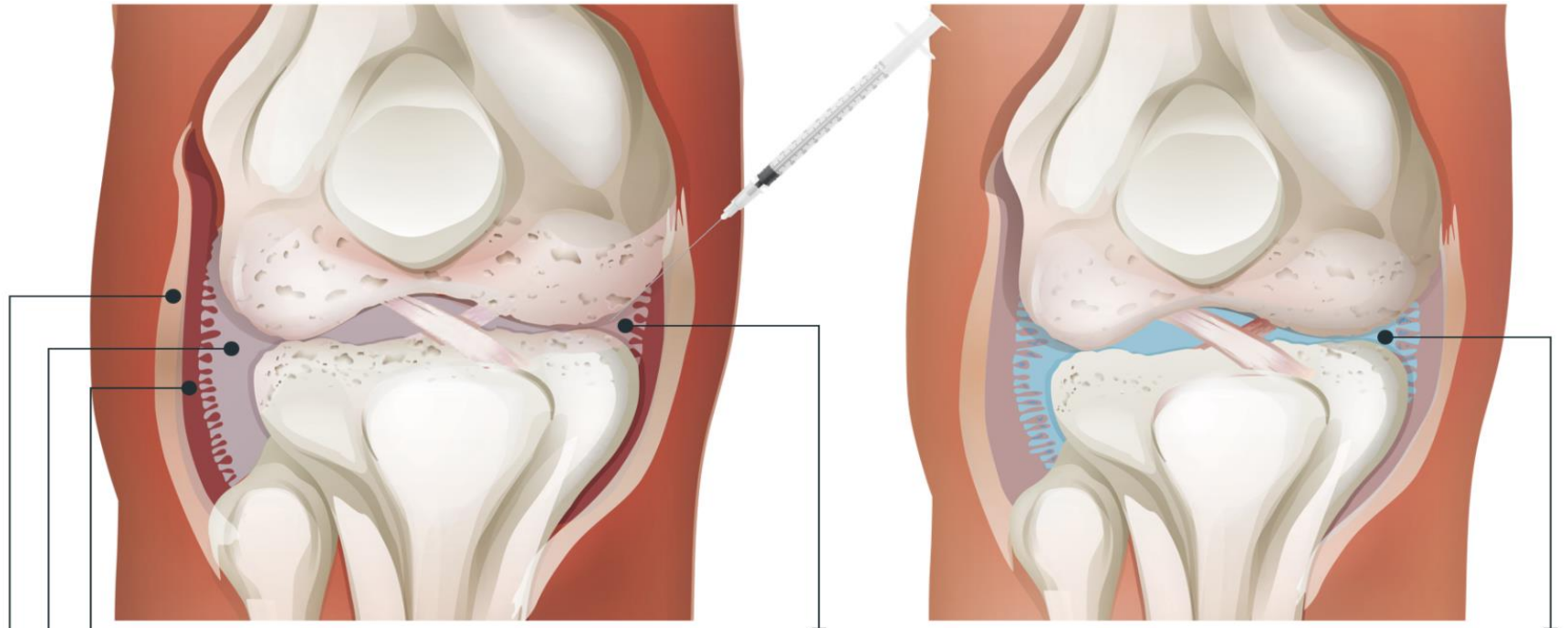
What is a hydrogel?

- Completely new class of injectable
  - 97.5% Water
  - 2.5% Polyacrylamide
- Non-degradable
- Bio-inert
- ***"Permanent" Injectable Implant***
- ***Integrates into synovium***
- Reduces Inflammation



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What is a hydrogel?



Synovial membrane (layered with synovial villi) with multiple inflamatory cells

Joint cavity containing synovial fluid

Joint capsule

Arthrosamid® is injected into the synovial cavity where it sits within the synovial fluid — providing lubrication that cushions the inner joint capsule.

Acting as a scaffold, Arthrosamid® fully integrates in the synovial membrane, thickening it and providing a physical barrier that interrupts the inflammatory cycle — thereby reducing pain.

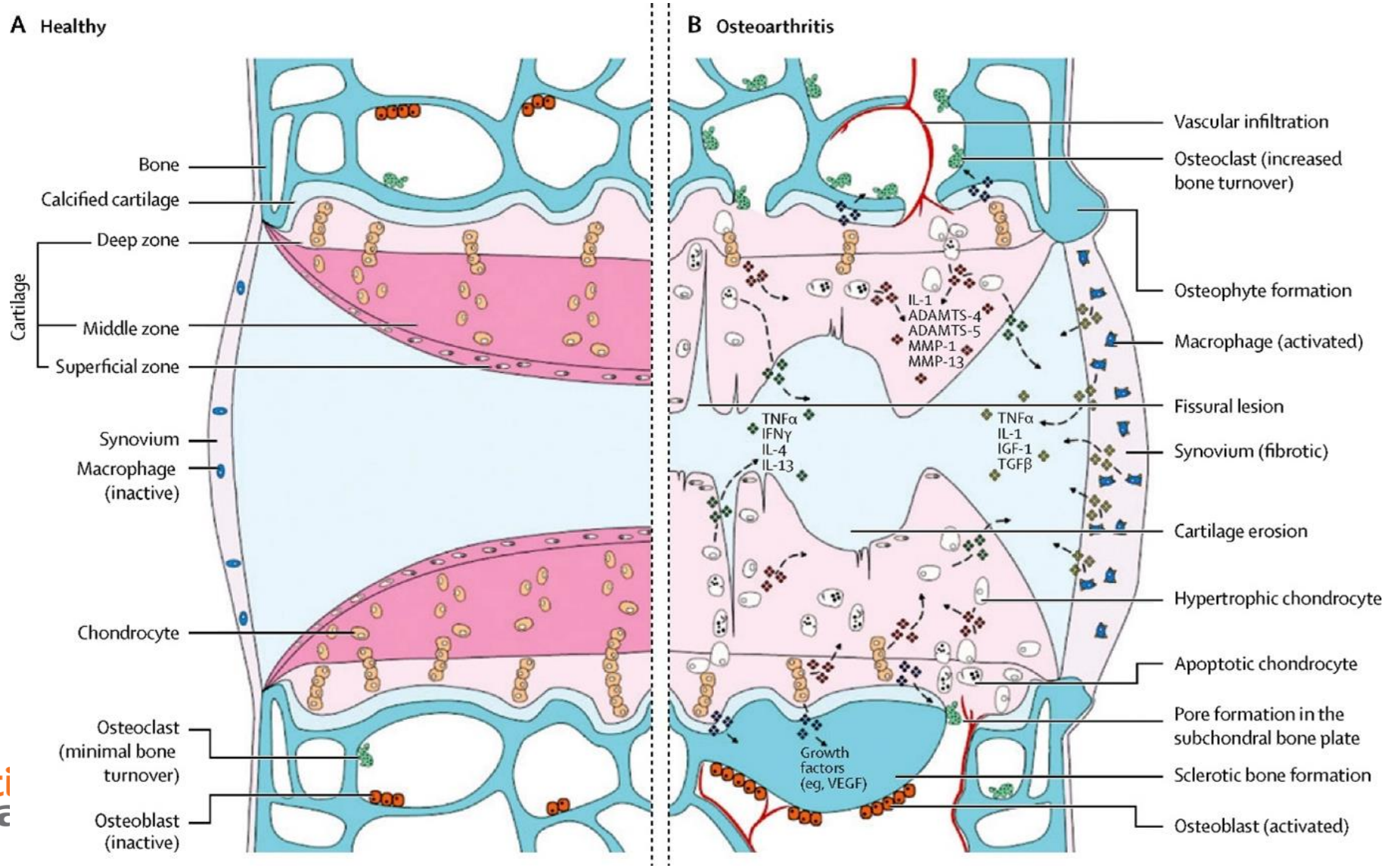
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What is a hydrogel?

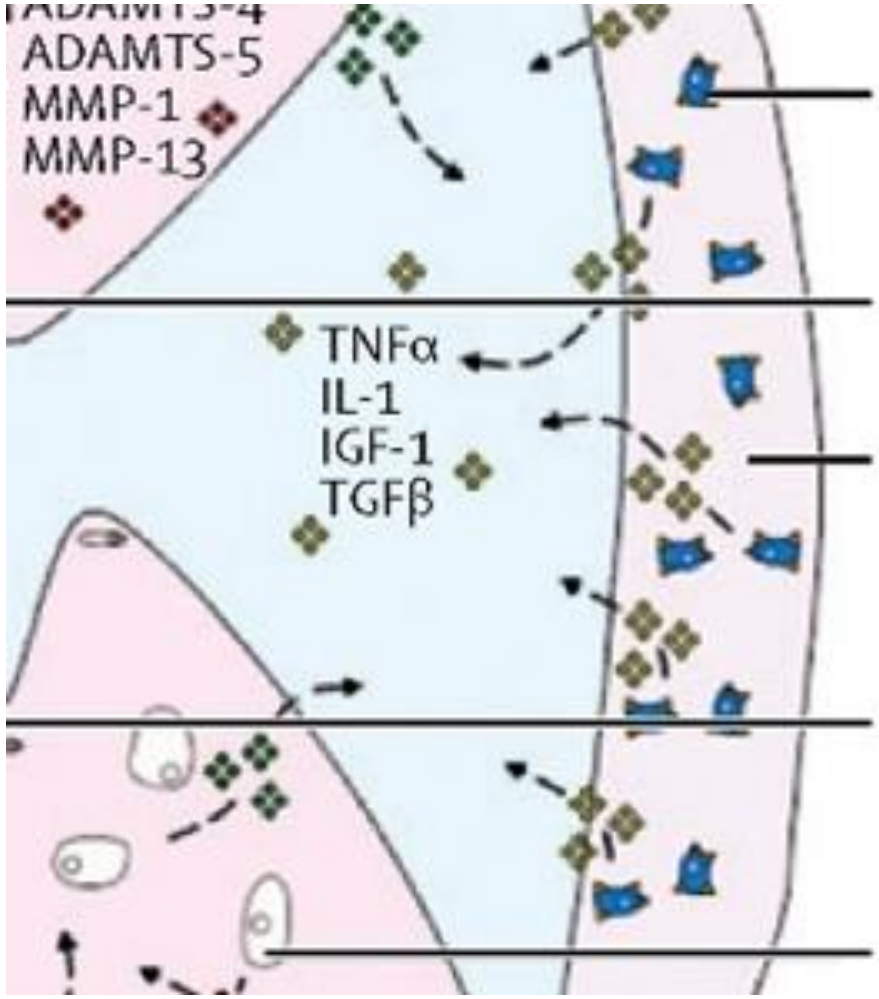


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Pathophysiology of Arthritis

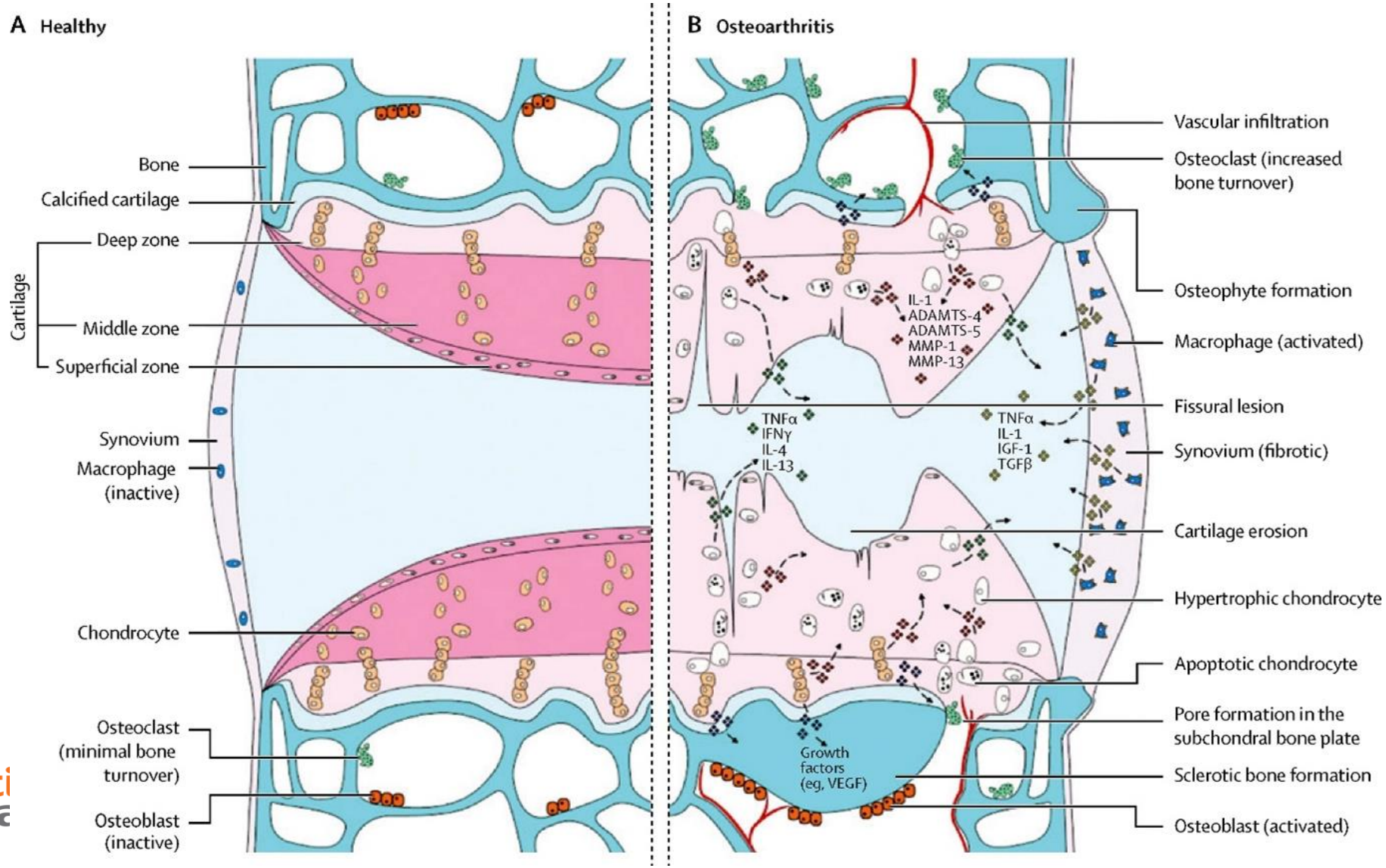


Pathophysiology of Arthritis



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Pathophysiology of Arthritis



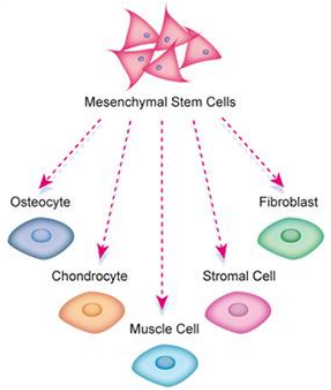
All injectables are “Anti-inflammatories”

- Early = Inflammation
- Late = Inflammation and Bone Marrow Oedema
- Most injectables have similar magnitude of effect
- Duration differs greatly



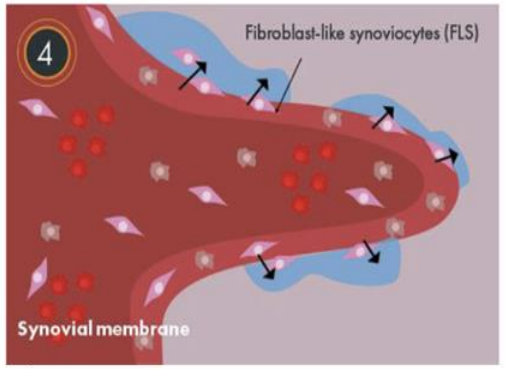


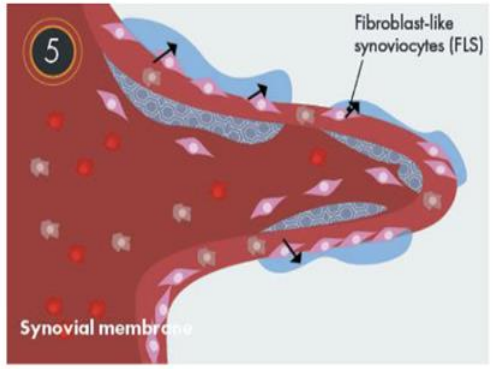


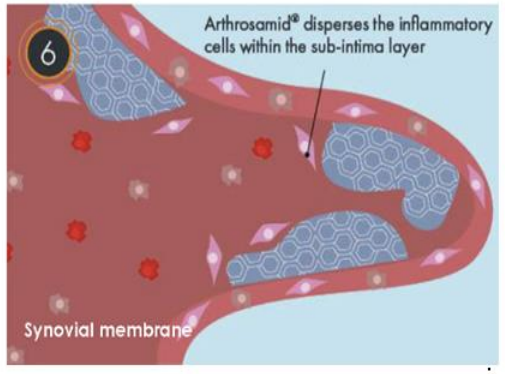




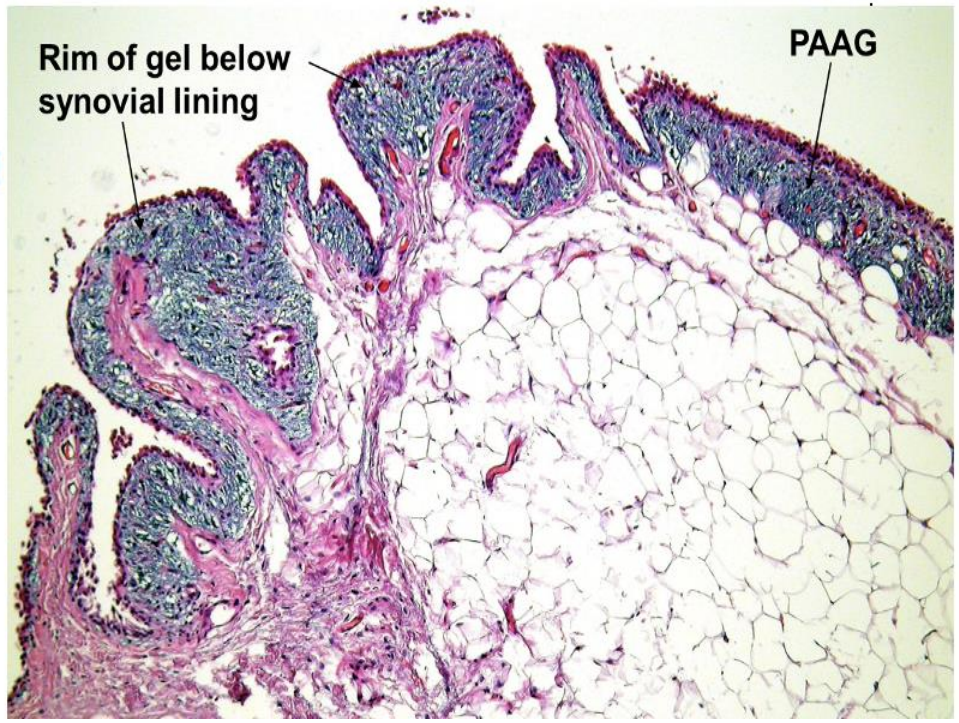




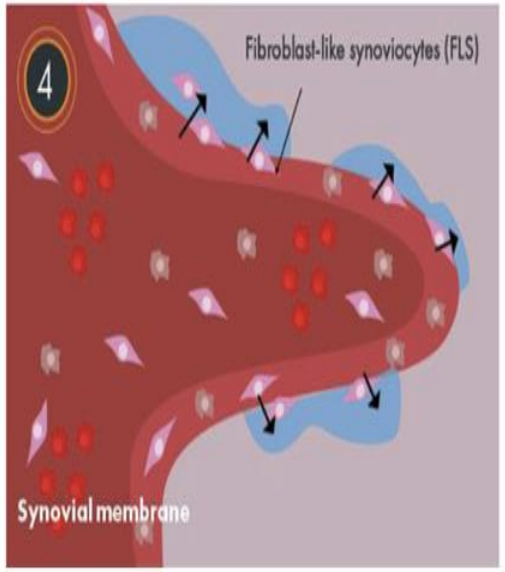


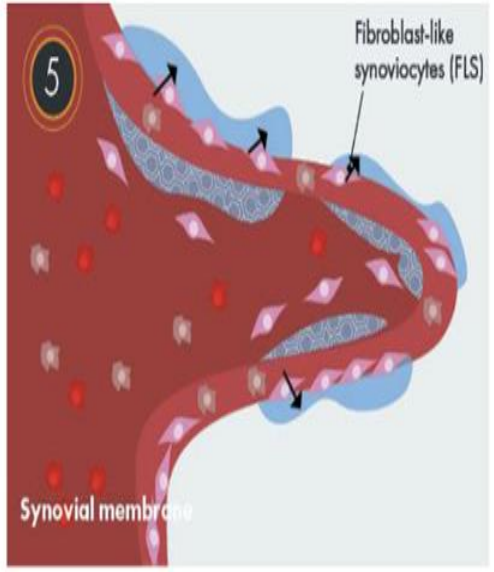


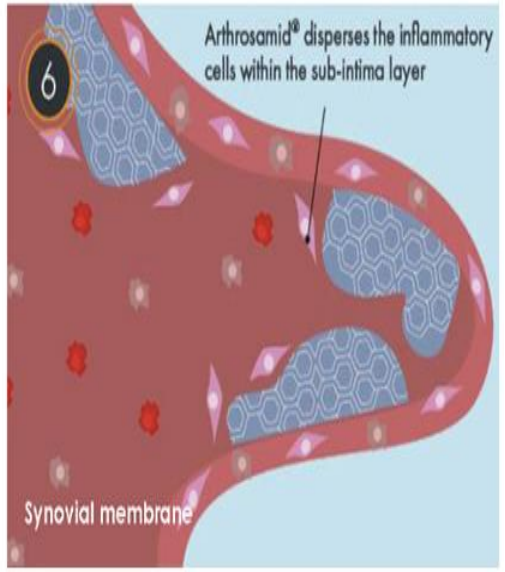


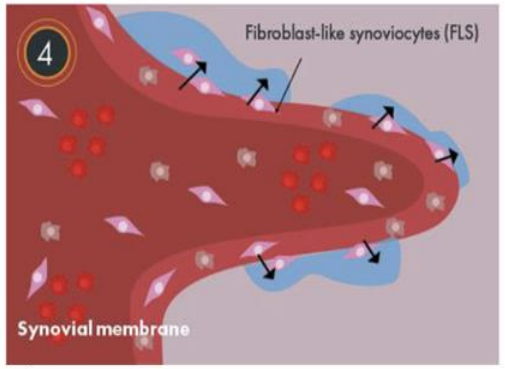


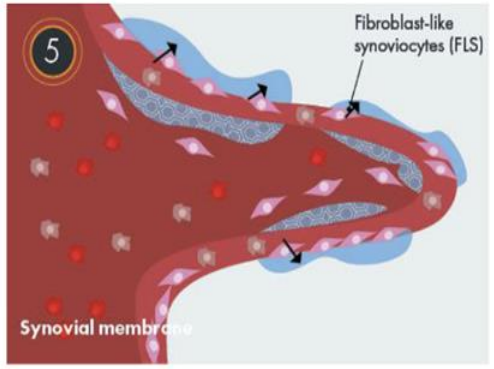
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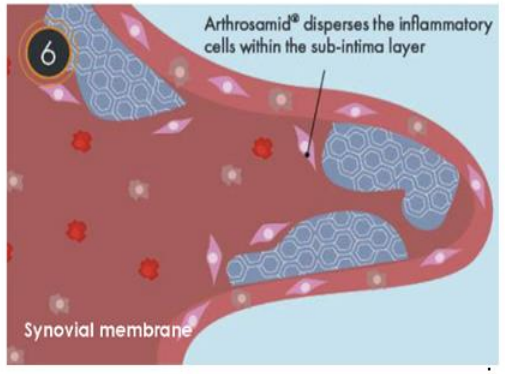

4
Fibroblast-like synoviocytes (FLS)
Synovial membrane


5
Fibroblast-like synoviocytes (FLS)
Synovial membrane

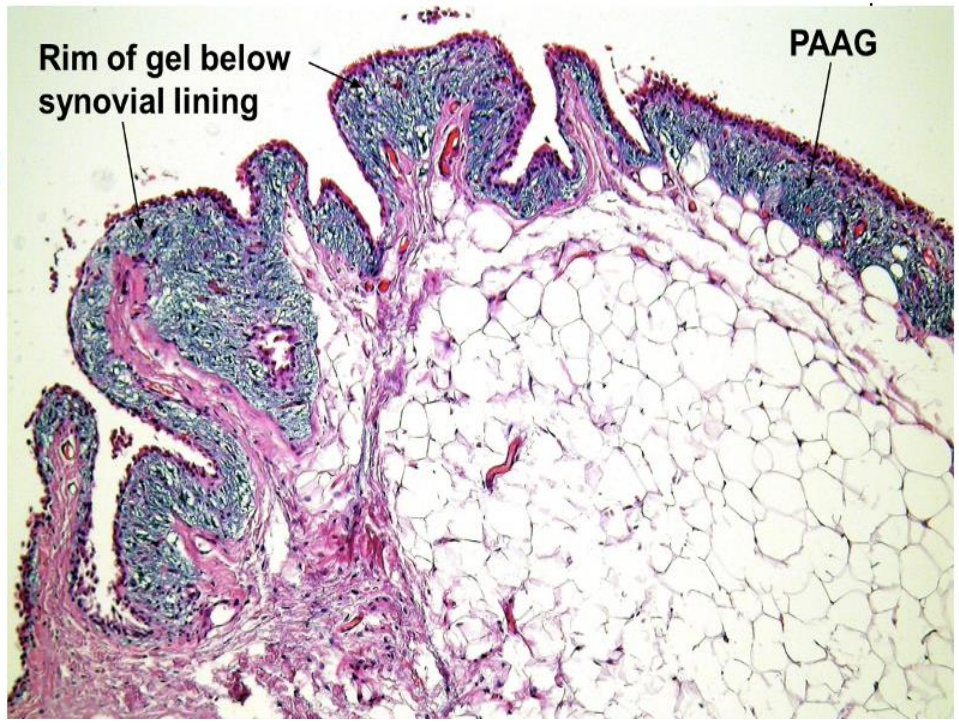

6
Arthrosamid® disperses the inflammatory cells within the sub-intima layer
Synovial membrane











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Is it safe?

Adverse event	Number of subjects	Number of events	%	Severity, n		
				Mild	Moderate	Severe
Arthralgia (joint pain)	6	6	12.2%	4	2	0
Joint swelling	4	4	8.2%	4	0	0
Synovial cyst	3	3	6.1%	3	0	0
Pain in extremity	1	1	2.0%	1	0	0

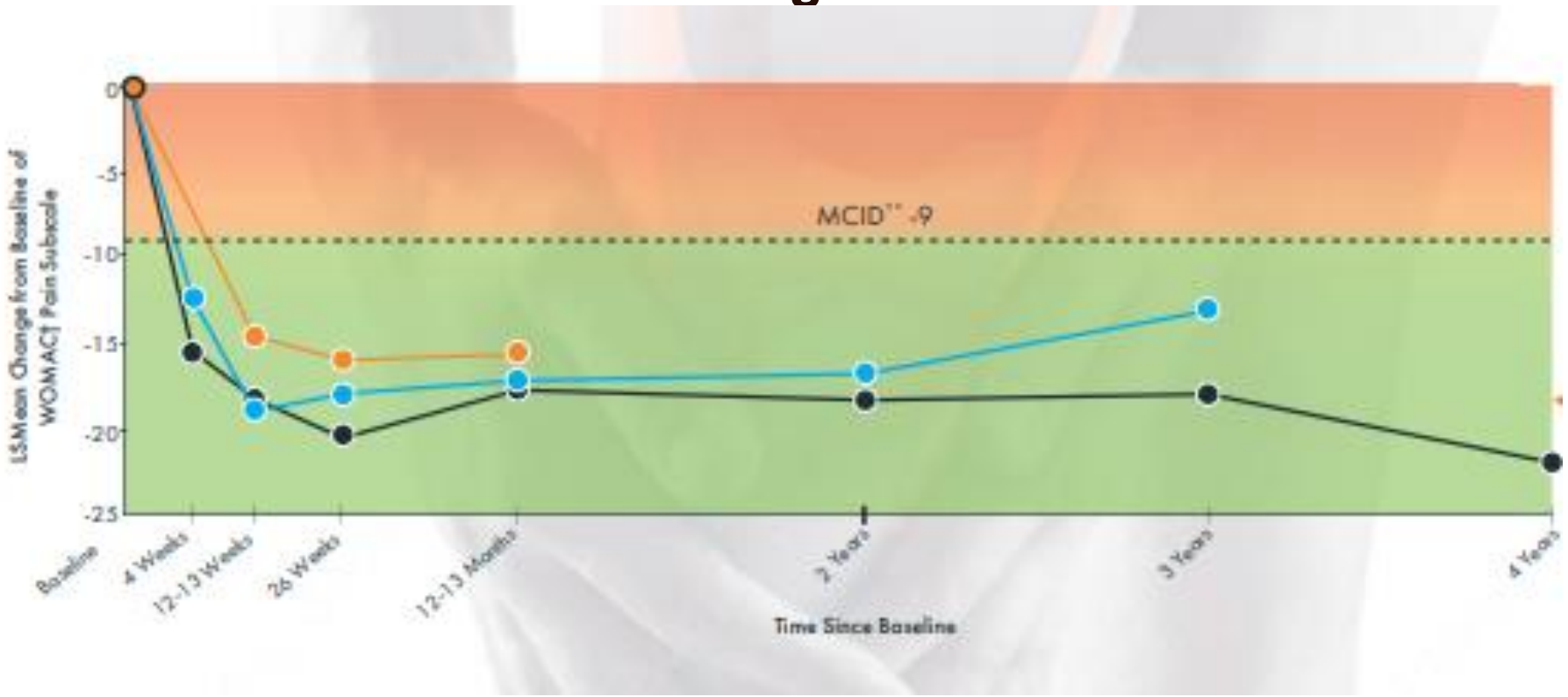
- Used in urology and aesthetics > 10 years
- 4 year Adverse events data collection IDA Study
- Most frequently reported ADEs were arthralgia and joint swelling
- No Major Side effects

Data on file: Clinical Investigation Reports IDA Study

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Does it Work?

WOMAC Pain Subscale Change from Baseline



12-13 Weeks Response Maintained

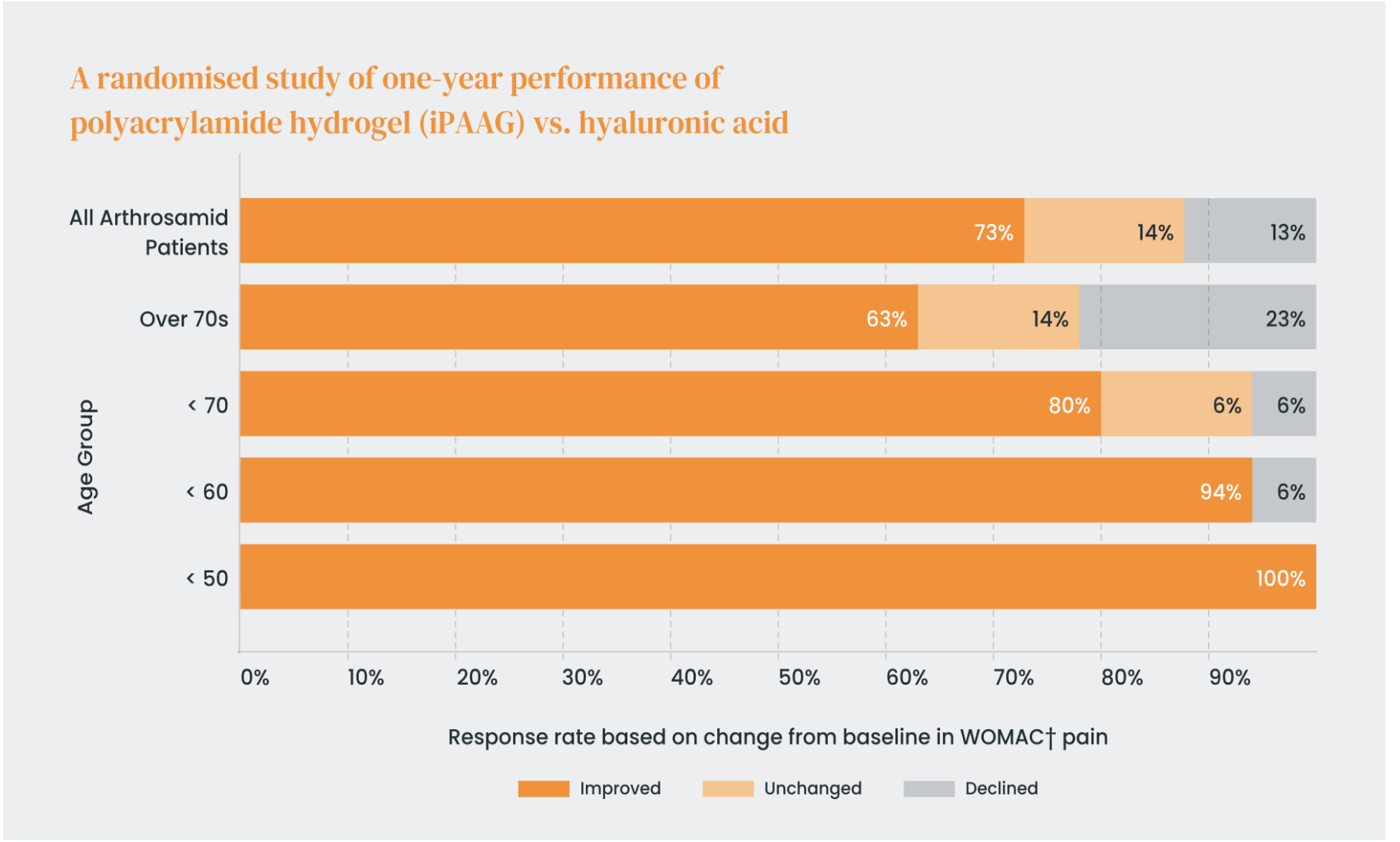
13 Months in DAISY Study[1]

3 Year in ROSA Study[2,3]

3 Years in IDA Study[4-8]

[1]Henriksen M, et al. Clin Exp Rheumatol. 2018; 36 (6): 1082-1085
[2]Bliddal H, et al. Osteoarthritis and Cartilage. 2022; 30: S370-371
[3]Data on file: Clinical Investigation Reports ROSA Study
[4]Bliddal H, et al. J Orthop Res Ther 6. 2021; 1188
[5]Bliddal H, et al. Osteoarthritis and Cartilage. 2021; 29: S278
[6]Bliddal H, et al. Osteoarthritis and Cartilage. 2022; 30: S371-372
[7]Henriksen, M, et al. Osteoarthritis and Cartilage. 2023; 31: 682-683
[8]Data on file: Clinical Investigation Reports IDA Study

What's the downside?



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Real World Data

- Prospective Cohort
  - 200 Patients to date
  - 116 available full data sets
  - Age 41-89 years
  - KL 2-4 Knee OA
  - Baseline and 3 months

- OARSI
  - 100 Responders (84%)
  - 16 Non-Responders (16%)
    - 10 Unchanged (1 TKR)
    - 6 Worse (1 TKR)

Mean Scores	Baseline	3 Months	t Test	MCID	SCB/PASS
VAS Pain (100)	68	41	<0.0001	8.4 to 19.9	27 to 31
OKS (48 worst)	28	17	<0.0001	4.8 to 5	<18
WOMAC Pain (100)	60	34	<0.0001	9 to 12	n/a
WOMAC Total (96 Worst)	56	35	<0.0001	16.1	n/a

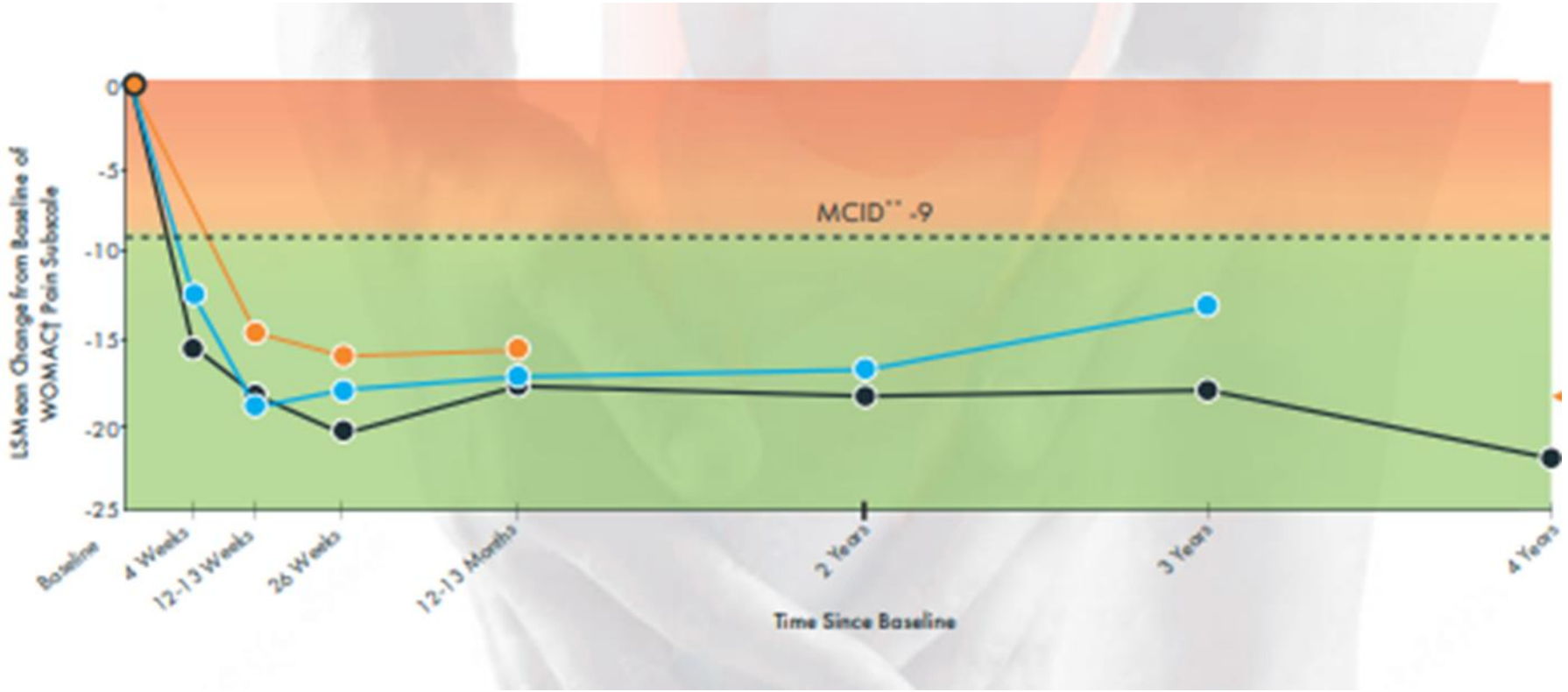
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WOMAC Total (96 Worst)	56	35	<0.0001	16.1	n/a

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Real world data vs trial

- Limitations
  - Limited number
  - PP ≠ Trial
  - Short term FU to date



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Real world data vs trial

WOMAC Pain Baseline
60.4 > 50.3 (IDA)

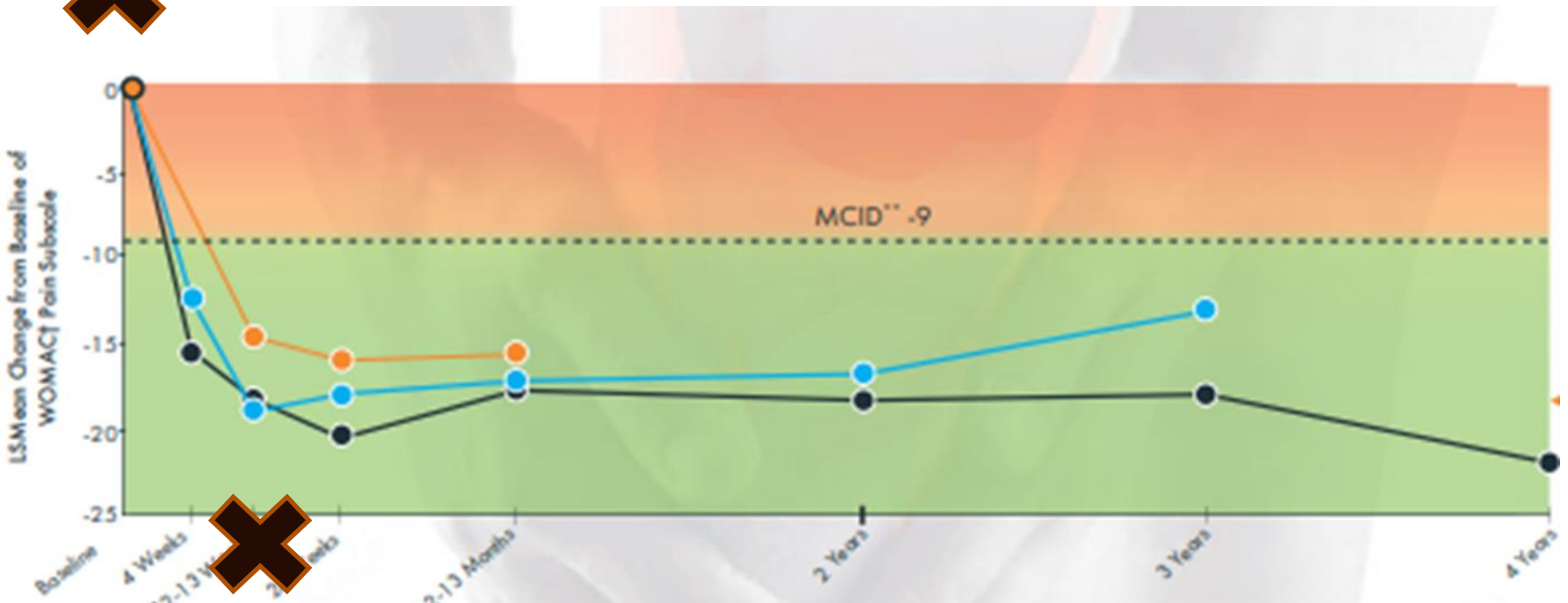


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Real world data vs trial

WOMAC Pain Baseline
60.4 > 50.3 (IDA)



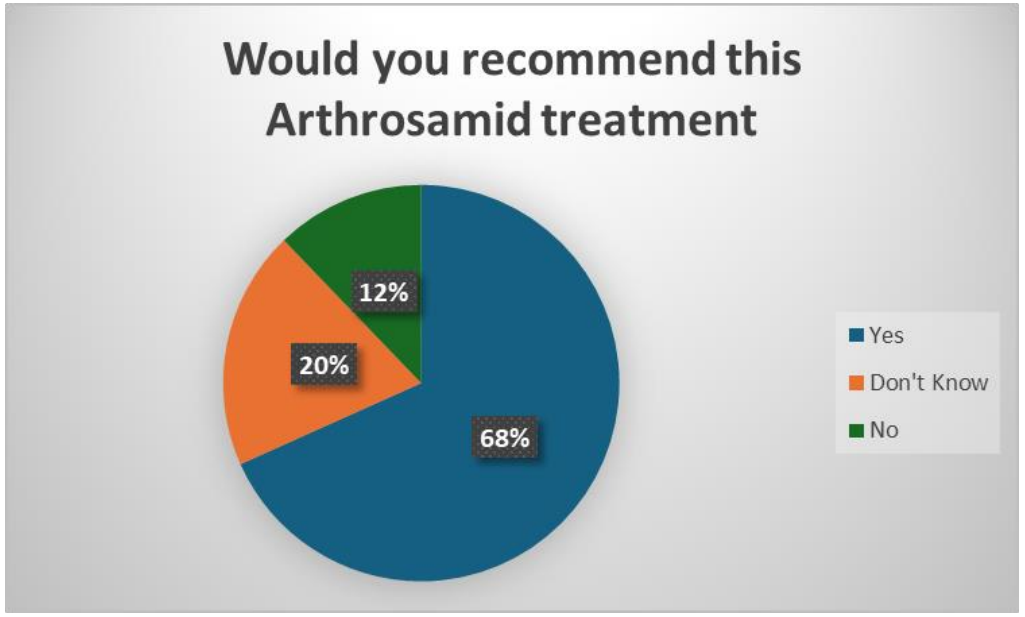
Change in WOMAC
-26 vs -20 (IDA) or -15 (DAISY)

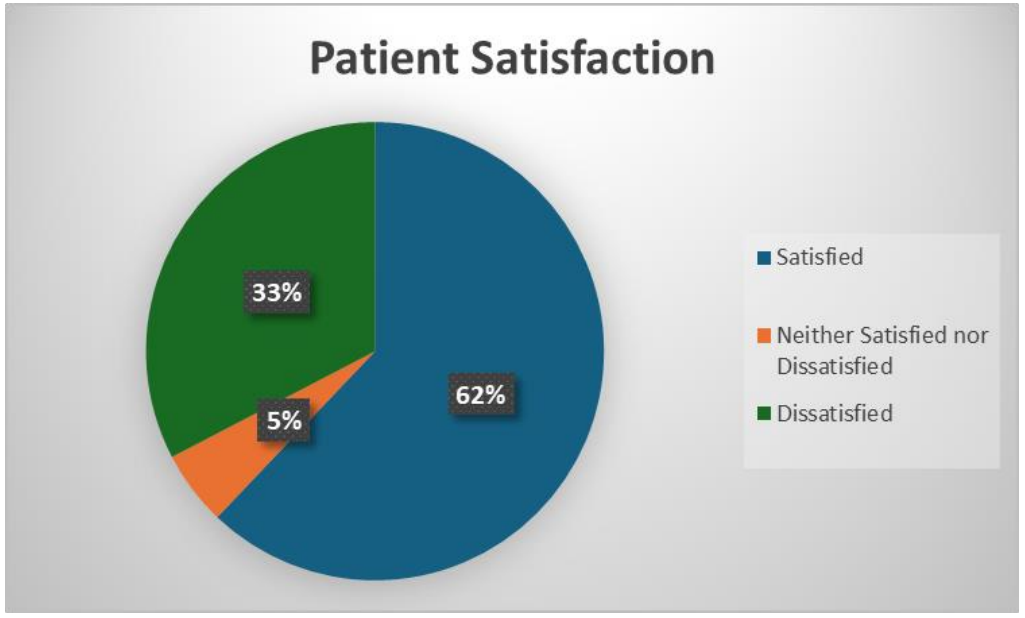
- Limitations
  - Limited number
  - PP ≠ Trial
  - Short term FU to date

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Real World Data - Satisfaction

- Hydrogels
  - Arthrosamid Survey
  - 95 Patients
  - 6 UK Surgeons
  - Unselected
  - Anonymous Survey





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Hydrogels – Arthrosamid - Final Thoughts

- Joint replacement
  - Gold Standard Severe OA or deformity
- Hydrogels
  - Severe OA and non-surgical candidate
    - Set expectations
    - Generally halves pain score and makes pain manageable
  - Moderate OA and Pain seem best candidates
  - Inflammatory features good prognostic sign

  - Short term results very promising
  - Long term “non-commercial” studies awaited

Arthritis Research UK

Thanks for your time

ARTHROSAMID®

Safe & Effective

Arthrosamid® remains safe and effective [21, 23] for its intended use 5 years after treatment. [41]

Pain Reduction

In all our studies, [1,13,16,21,23,26,27,40,41] Arthrosamid® exceeds the MCID of 9 points [16] and improvement is maintained up to 5 years after a single injection. [41]

Close to 80% Response rate [7]

Patients in the under 70 years group reported close to 80% positive response rate following treatment with Arthrosamid®. [7]

Longterm pain reduction

Statistically significant reduction in pain maintained at 5 years. [41]

Significantly different

Significant difference in change from baseline between Arthrosamid® and Synvisc-One® at 52 weeks. [24]

Stable & Significant

Stable and statistically significant change on all WOMAC subscales and WOMAC total over the 56 week observation period. [16]

Arthr
Res

Welsh Orthopaedic Society Annual Meeting 2025

Podium Presentation Session 1: Hip, Knee

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