Academy of PHYSICAL MEDICINE

Broadcast Summary

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OA Knee: Rehab
With Claire Minshull

About Claire Minshull

- Founder and director of Get Back to Sport - works with Clinical Commissioning Groups to provide an innovative community management programme for knee and hip osteoarthritis; provides research-informed and evidence-based CPD and training for rehabilitation professionals to better understand strength and neuromuscular conditioning and optimise neuromuscular recovery.

- Research fellow - The University of Edinburgh from 2013 – 2015. Led a collaboration between Edinburgh University, Queen Margaret University and the Royal Infirmary of Edinburgh's Trauma & Orthopaedic Unit, forging new research into patient rehabilitation following orthopaedic surgery. Researched and developed pre-rehabilitation strategies prior to elective surgery and managed major clinical trials.

- Senior Lecturer in Exercise Physiology and Health at Nottingham Trent University from 2005 – 2013.

- PhD in Exercise Science from Bangor University, focussed in neuromuscular performance and exercise stress associated with the stabilisation of synovial joints.

- British power lifting champion in 2010. Reviewer for peer-reviewed journals including the European Journal of Sports Science.

- http://getbacktosport.com

Osteoarthritis (OA)

- The musculature around the joint is akin to biological scaffolding – the better the quality, the better the functioning and stability.

- The knee is a particularly important joint in terms of mobility. From a sporting perspective, it is injured frequently. As people age, knee OA is highly prevalent.

- It is not clear why OA develops in the knee. It is multifactorial i.e. genetics, prior injury, physical activities, job, lifestyle, and behaviour.

- Just because people have osteoarthritic changes in their joints does not necessarily mean they are symptomatic.

Risks for OA

- The weight or load going through a knee is a critical factor to the onset of OA. Changes to those joint surfaces that are symptomatic compounded by a load, is going to make them sorer.

- It is unclear whether diet (i.e. chronically consuming high fat, paleo diet, acidic diet) has a direct link to the onset of OA.

- Painmakes it difficult to maintain high levels of physical activity: sufferers feel depressed and may "comfort eat" (i.e. calorie loading).

Efforts have been made to incorporate an exercise referral scheme in the NHS particularly for knee OA. However, achieving change in the NHS is seldom a rapid process…

The model:

- Strength-focussed exercise referral programme.

- Patients (aged over 45) go to the GP with a sore hip/knee.

- Triaged by an up-skilled physiotherapist into a 12-week exercise referral programme. The physiotherapist is there to supervise or backstop the fitness professionals and provide clinical advice to patients who are there during their rehab or their conditioning phase.

- They will be referred into a gym. The 12-week exercise programme will be delivered and overseen by up-skilled fitness professionals.

- Cognitive/psychological education programme runs in parallel – a holistic approach to healing the mind and the body.

Rehabbing knee OA

- GPs invariably offer very little advice: analgaesics and advice to reduce exercise/movement. This results in a rapid worsening of muscle condition.

- Often, simple (acute) joint/muscle problems become chronic due to NHS waiting times. Patients start rehab in a degenerative state.

- Good rehab is about defining what the patients' goal is and their current MSK status, then building up the programme (usually end-stage rehab) from there.

- Involves looking at how the muscles and joints function and then optimising the interventions to bring about the muscle adaptation in order to get people back to sport or, for example, walk their dog for 4 miles on unstable ground with OA or total knee replacement.

- Making the muscles around the joint stronger improves pain and patient performance.

- Patients with knee pain need to be given a significant load through the knee. This will initially generate a response – the pain may get worse in that first acute period. But when the musculature is developed more, the pain decreases. The level of function in that acute phase goes up. The knee may swell a little but can then be controlled (i.e. cold compression, elevate feet).

- It would take about six weeks into the programme before the level of functioning improved, the pain significantly reduced, and the strength increased.

Non-pharmacological interventions for OA

- *Escape Pain* is an NHS exercise programme, delivered in a class format. However, the exercises are low grade, with very little resistance: not useless, but far from ideal.

Diet and supplementation

- Vitamin D helps people. It has a very low-risk profile. It can also help reduce or delay degenerative conditions, osteopenia, OA, etc. But there is little evidence in animal models that shows it can help with the repair of muscle and nerve tissue following injury.

- Evidence suggests that Glucosamine Chondroitin does not have much effect biologically. It can be taken as long as it is safe and people feel better.

- Generally, as people get older they tend to consume less protein. If they do not have adequate protein and they are put through a resistance conditioning programme which stimulates muscle synthesis, then the desired muscular adaptation could be impaired.

- Once people get into an exercise habit to develop their musculature, their diet should also be considered.

Research and related studies

- Very few (if any) of the thousands of studies into management of knee OA through resistance training meet adequate standards. Claire's systematic review identified only 34 which met the the inclusion criteria, but none of the methodologies cited was replicable.

- Only one of those 34 studies came close to actually provide meaningful data on strength training protocol for OA.

- There are research papers that link OA pain and lack of muscle strength (i.e. the greater the pain the poorer the physical status and quality of life). This can be reversed by improving through strength training.

- Ideally, there should be a model of prevention or early intervention for younger patients with joint issues but it has become more lucrative to take those patients who are due for the next level treatment option i.e. joint replacement.

- An average clinical commissioning group might do somewhere between 200 and 400 knee joint replacements per year, costing an estimated £2m.

- Around 25-40% of the patients do not have better outcome post joint replacement surgery.

- Research shows that losing weight helps people with their symptoms and functionality in OA. It is not just about losing mass. It is about exchanging fat mass for lean tissue (i.e. useful muscle tissue). Muscle tissue helps a joint function better, stabilises it, and absorbs shock (i.e. cushioning structure).

- Osteoporosis: resistance training has tremendous benefits for bone mineral density, spine curvature, and stability.

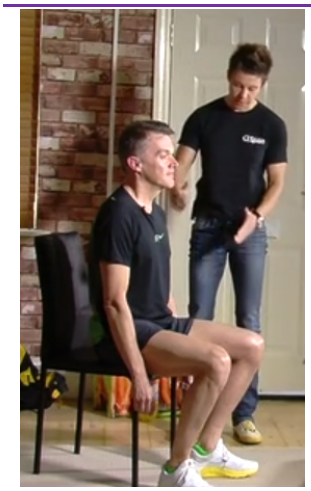
- Between 1 to 3% of muscle mass, strength, and quality are lost per year after the age of 50.

Demo – movements for patients with OA knee

44:30 to 1:04:55 in the broadcast recording

- With knee OA, the quadriceps are really important in joint function and daily life activities.

Sit to stand exercise:



This is recommended for muscle strengthening. A stable chair is needed - should be placed against a table or wall to avoid the possibility of slipping away from patient.

Instructions:

- Patient should be seated quite close to the front of the chair. Heels underneath the knee (90-degree knee bend).
- Hands out in front. Stand up by pushing through the heel then back down onto the chair.
- Repeat x3.

- For people with OA, sitting down and standing up with a flexed knee can be painful. One remedy is to Increase the height of the seat so that the knee flexes less. Alternatively, people may lead with the leg that is not painful.
- To increase muscle strength the load should be increased. It is advisable to have a heavy load but doing very few repetitions.
- To make it more challenging, people can wear a loaded backpack (e.g. 2 litres of bottled water = 2 kilograms) while doing the repetitions. Can be increased up to 4 kilograms or more depending on the patients' condition.
- The weight should be sufficiently heavy so that they can only do up to 5 repetitions maximum (i.e. 5 repetitions to failure – meaning they cannot do a 6^{th} with proper form).
- Key is to increase the weight, not the repetitions. Strength gains are far superior with high load.
- If people get pain having the load on their back, try reducing the symptom by shifting the load to the front.

Plyometric training

- It is a knee strengthening exercise which involves jumping up onto a box or a step from a standing or a bent knee start.
- A study suggests that the outcomes were good among post-menopausal women with knee OA. The water content of cartilage cells was much better post-plyometric training.

Open/closed kinetic chain exercises

- A closed kinetic chain exercise is where the foot is in contact with something (e.g. Squat, leg press).

- An open kinetic chain exercise is where the foot is not in contact with something (E.g. leg extensions, hamstring curls). One way to do it is to have the patients sit on a slightly higher chair, meaning that their knees are less flexed such that a *Theraband* can be tied to the back of the chair and wrapped around their ankle or foot. This enables patients to perform a resistance exercise by extending their knee.

- Key here is to experiment with range and with the foot positioning because every symptom is different.

One leg stability exercise

Instructions:

- Place the foot onto the step, push through the heel up onto the step and then back down. Make sure that the knee is over the toe before lifting the body weight up.

- Keep the injured foot on the step, then the other foot on the floor. The weight should be put through the 'bad' foot. Assess whether or not patients have got the control to load up.

- Patients should have something to hold on to stabilise themselves if need be (e.g. handrail, wall).

- Start to put load once the patients have already established control and balance. Note the five-repetition maximum range.

- People should be able to lift a lot more than their body weight to improve strength.

- Lower the step if it was particularly symptomatic, increase the height (2 steps up) as a progression.

- This one leg exercise is more challenging than a double leg because patients have a single leg position controlling the deceleration of body weight under gravity.

NOTES:

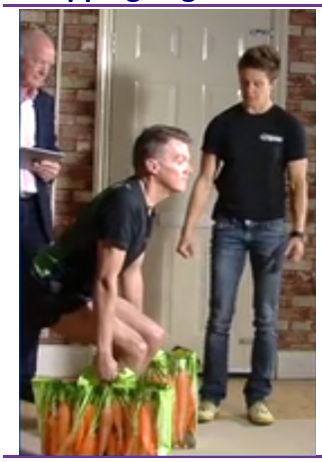
a) Seek clinical guidance when prescribing these exercises to people with osteoporosis.

b) Load people up in a range of motion that is functional for them. Precaution should be taken for those with back problems, shoulder problems, cardiac and high blood pressure issues.

c) When dealing with OA patients, in particular, look at the muscle strength first and foremost.

d) Be very specific with what to do with developing strength because people lose muscle strength after the age of 50.

Shopping bag deadlift



Instructions:

- Weights (i.e. bottles of water) are loaded in a pair of shopping bags that are capable of holding heavy weight. Bottles can be filled with sand for greater weight.
- Patients should position the bags by their side. Legs apart then go into a squat position.
- With chest pointing forward, stand up and lift the bags, and then back down. Repeat.

- A deadlift involves picking a weight off the floor. It involves the hips, knees, and ankles which are crucial in lower limb stability and strength.
- This exercise requires a slight hip flexion, and knee bend and flexion. Deep knee flexion might be painful.
- Increase the weight and range as the patients' condition improves.

Developing muscle strength

- To develop muscle strength, work between 3 to 5 (maximum) repetitions. This means that after 5 repetitions, people can no longer do the 6th one with proper form because it is just too heavy – they start to get that burning feeling.
- To elicit a particular response, it should be between 25 to 45 repetitions per muscle group per week. (E.g. 3 sets of knee extensions and 3 sets of leg press twice a week for 2 weeks then increase the volume progressively).
- Apply progressive approach for the resistance training programme.

- When people get some adaptation and some development in strength or endurance, after a short period of time, it is necessary to then determine the specificity of the intervention to further address those outcomes (i.e. endurance, stability, strength, balance). This is the reason why a progressive approach is advised.

Case discussion

Patient description

- Knee problem (not a sporting injury); tight quads and hamstrings which irritated the knee bursa causing joint inflammation. Had a swollen bone marrow in the other knee because of a serious injury.

- Rolling and stretching helped reduce the swelling.

- Noticed that going through a strength training weekly does trigger inflammation/irritation but tend to reduce each week.

- Was advised to restore flexibility through a lot of stretching exercises, hardly running. Was able to gain strength but has significant balance issues on certain exercises.

- Used to run 60-70 miles a week.

Notes

- Generally, when people disengage from exercise, muscle strength, balance and reaction to perturbations are likely to have dissipated, and it becomes a challenge to resume doing such exercises.

- There is an increased risk of injury through a sudden spike in training.

- Doing 12 repetitions to failure can generate strength gains of about 26% improvement. Doing 3 to 5 repetitions to failure can generate strength gains over an 8-week period about 69% improvement.

- Strength training for runners (after losing strength through an injury) and positive thinking, actually enhances running performances.

Recommended approach

- Rarely advisable to tell a patient to stop their preferred exercise (including running). Negative language has a very strong cognitive/psychological effect, which may result in an increased pain response.

- Always encourage 'possibility' unless there is a strong clinical basis for them to stop pursuing a sport.

- To maintain strength, do a high load low repetition session once a week (i.e. 3-5 repetitions to failure; between 25 to 45 repetitions per muscle group per week). This will sufficiently maintain the existing strength gain already acquired.

- The patient should record the total volume of training done in a week (i.e. gym work, running work, rehab work, etc.). Monitor them daily over a period of weeks. Use that as a guide for the next objective which is, for example, increasing mileage to get back to running.

Other relevant notes

- Strength gains can still be achieved in sarcopenic patients. Studies that show that women in their 90s still benefitted from strength training.

- Exercise bike is one of the best exercises for joint health. For those with a sore knee, play around with the resistance and joint positioning.