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Case Study – Tennis elbow / Lateral Epicondylitis

The case was a 40 year old male presented to the clinic with a 3 year history of right sided elbow pain at the site of the lateral epicondyle, in keeping with the symptoms of lateral epicondylitis. He also had pain slightly distal to the epicondyle in the region of the proximal common extensor tendon and musculotendinous junction. His symptoms were idiopathic, but he did think that they were a result of typing a lot for work. The patient described his typing position as doing so with wrists in extension, which is a known cause of lateral epicondylitis (Vicens et al. 2017).

He was a keenly active man, with an athletic build. He also regularly took part in gym activities, namely free weights and machines, paddle boarding and kite surfing. He found that all of these activities were hindered by his pain, which also aggravated it, making it more painful for extended periods after the activity. He had even got to the point where normal daily activities such as lifting a kettle or pan were extremely painful.

Physical examination revealed a normal range of motion in flexion and extension, supination and pronation, but the patient was guarded whilst doing them actively, anticipating pain. Resisted elbow flexion in supination was unremarkable but the pain of complaint was reproduced in resisted elbow flexion in pronation and semi pronation. Pain was also reproduced in resisted wrist extension - “Cozen’s test” which is usually a good indicator with a suggested 91% sensitivity for diagnosing tennis elbow (Dones III et al. 2014). The proximal wrist extensor muscles were also hypertonic on palpation.

Pain levels were measured using the visual analogue scale (VAS) where he reported an 8/10 pain level. He scored 16 on the Oswestry disability assessment, meaning borderline mild to moderate disability.

The patient’s medical history was largely unremarkable, he was mildly asthmatic and used a Salbutamol inhaler ad hoc. He was a team manager at a bank but predominantly worked from home.

The patient had also received 2 previous cortisone injections, 6 and 12 months previous to his consultation. The first was with fenestration/ dry needling, and the second was without. He reported that the first injection lasted 8 weeks and symptoms were 90% improved for the duration. The second injection gave 6 weeks pain relief at 90% improvement. Pain returned to pre injection levels in both cases.

IMAGING

Before presenting at the clinic, the patient had undertaken an MRI and X-ray of the elbow. The X-ray findings were unremarkable. The MRI findings showed a partial tear in the extensor carpi radialis brevis, involving 30% of the tendon. It was decided that it would be of little use re-performing the X-ray or MRI, but an ultrasound could be beneficial as contrast and spatial resolution is better with ultrasound than MRI, meaning more subtle tendon tears and inter tendon fibrillations can be visualised better, as well as being able to visualise smaller calcifications (Levine et al. 2012).

SONOGRAPHY FINDINGS

The ultrasound system used was a Konica Minolta HS-1 with a linear probe set at 18Mhz. The common extensor tendon had a poor fibrillar pattern and was mildly heterogenous in keeping with tendinopathy. The extensor carpi radialis brevis did have the mentioned tear which was still involving 30% of the tendon. The cortex at the insertion was also mildly irregular, also suggestive of insertional tendinopathy. The radial collateral ligament was intact, and no excessive movement was noted on the varus stress test. The musculotendinous junction and the muscle bellies were normal. The articular cartilage was normal, and no joint effusion was present. The findings were in keeping with previous diagnoses received by the patient.

TREATMENT PLAN

The patient had already been down a long road of treatment before coming to the clinic. 2 cortisone injections were given, and 18 months of rehabilitation exercises recommended. As with many rehabilitation protocols it is common that patients do not perform them as instructed or at the correct frequency (Essery et al. 2017), but this patient insisted that he was compliant, and his history of lifestyle would support that. Although some patients can over do their rehab with over enthusiasm (Temitayo et al. 2019). He felt that he had exhausted rehab and that cortisone injections were only giving temporary relief. He was advised by his specialist that PRP injections were a suitable next step in his treatment.

The treatment modalities considered were:

- More rehabilitation. Although the patient was keen to try PRP, I explained that rehab was at the foundation of his recovery and that he would need to continue that regardless of other treatments. It was also decided that a review of his current rehab protocol would be undertaken first.

  He had been given 5 main exercises to do.
  1. Fist clench. He was instructed to grip a rolled-up flannel. 10 x 10 second squeezes. Designed to exercise the long flexor tendons & muscles.
  2. Supination with a dumbbell. He was instructed to sit with his elbow on his knee, with the elbow at 90 degrees. He was to supinate the forearm using a 1kg dumbbell for 20 repetitions. Designed to exercise the supinator muscle.

3. Wrist extensions. In the same position as the supination exercise, he was to extend the wrist holding the 1kg dumbbell for 10 repetitions. Designed to exercise the wrist extensors.
4. Wrist flexions. In the same position but in wrist flexion. 10 repetitions. Designed to work the wrist flexors.
5. Towel twist. The patient was instructed to roll up a small towel, so it is compact and with an overarm grip, twist the towel. 10 times in each direction. Designed to exercise the forearm flexors and extensors.

It was agreed that the patient would remain doing these exercises as they were not causing him any extra pain or flare ups. In addition, it was decided that any new introductions would affect the confidence level in the effect of the PRP treatment.

- Shockwave therapy. This would have been the first treatment of choice as it has shown significant improvements with lateral epicondylitis (Kutay et al. 2010), but the patient had already tried shockwave. 6 sessions of radial shockwave with a local physio had little effect.
- Cortisone injection. The patient was not keen to have another cortisone injection as he was told that multiple injections can weaken the tendon and lead to rupture, which has also been suggested in some literature (Haraldsson et al. 2006). Cortisone injections also tend to have a limited time frame of efficacy (Rosen et al 1988), so it was decided that the benefit did not outweigh the risk
- PRP injections. This was the only modality that had not been performed. Although the body of evidence is varied, there was no extra detrimental effect that the intervention would have. Therefore, it was decided that PRP would be performed.

PRP THEORY

PRP involves the concentration of the patient's own plasma to significantly increase the concentration of platelets, growth factors, cytokines, monocytes and secretory proteins. In theory, the increased presence of these autologous substances aid the healing of damaged or degenerative tissues, thus reducing pain and increasing function (Arnoczky & Sheibani-Rad 2013).

> *"Although PRP has been increasingly utilized in the treatment of a variety of sports- related injuries, improvements in healing and clinical outcomes have not been universally reported. One reason for this may be the fact that all PRP preparations are not the same. Variations in the volume of whole blood taken, the platelet recovery efficacy, the final volume of plasma in which the platelets are suspended, and the presence or absence of white blood cells, and the addition of exogenous thrombin to activate the platelets or calcium chloride to induce fibrin formation, can all affect the character and potential efficacy of the final PRP product."*
> (Arnoczky & Sheibani-Rad 2013)

The PRP system used was the TROPOCELLS system made by Estar medical. This was the system of choice as the company promotes their system and patented gel system to remove red blood cells, virtually illuminate neutrophils while keeping a high number of monocytes. They also have the option of 11ml and 22ml tubes, the latter for bigger structures.

"Until recently PRP systems were unable to sustain the mononuclear cell population while eliminating the Red Blood Cells (RBC) and neutrophils. However, the advanced, patented separation technique utilized by Tropocells® removes the cells that promote inflammation and catabolism while producing a solution rich in platelets and monocytes. This optimizes healing and growth of the damaged tissue." (Estar medical 2021).

The cell concentration advertised are as follows:

From 11ml of blood

Platelet concentration fold	*4-5x*
RBC (10/ul)	*0*
WBC (10/ul)	*0.2*
Granulocytes %	*8.5*
Mononuclear Cells %	*86.2*
PDGF (pg/ml)	*2048*
VEGF (pg/ml)	*220*
EGF	*269*

(Estar Medical 2021)
PDGF – Platelet derived growth factor
VEGF – Vascular endothelial growth factor
EGF – Epidermal Growth Factor

It has been suggested that to achieve therapeutic levels, PRP must be at over 1 million platelets per millilitre. (Marx 2001) Tropocells suggest that with 5x platelet concentration, a total concentration will be 1.2 million platelets per millilitre. (Tropocells 2021)

Method

- Consent was obtained through detailed explanations of the procedure, expectations, benefits and risks.
- The patient was screened for any contraindications to PRP (blood thinners, steroid injections within the last 6 weeks and no intake of non-steroidal anti inflammatories in the last 7 days, metastatic disease, thrombocytopenia, hypofibrinogenaemia, haemodynamic instability, infection both chronic and acute, chronic liver disease).
- Venepuncture was performed on the patient and 11ml of blood was drawn in to a tropocells tube.
- The tube was set to spin in the centrifuge for 10 minutes at 1501rcf / 3800rpm
- 6ml of plasma was separated from the red blood cells and 3ml of platelet poor plasma was removed from the tube leaving a 5x concentration.
- The tube was inverted 20 times to resuspend the platelets.
- The remaining 3ml of platelet rich plasma was drawn in to a 10ml syringe.

- The patient was prepared using a sterile technique, sterile gloves, drapes, probe cover, sterile gel and area prepared with alcohol and iodine.
- Using ultrasound guidance, a 21g 1.5" needle was inserted into the forearm. No local anaesthetic was used as it is suggested that it will hinder the therapeutic effect of the PRP. (Kaux et al. 2015)
- Initially the insertion point at the epicondyle was fibrillated at the periosteum for 10 repetitions. It has been suggested that patient outcomes are slightly better with a combination of dry needling and PRP. (Stenhouse et al. 2013)
- A small portion of the PRP was injected in to the ECRB tendon tear and the rest of the 3ml into the common extensor tendon sheath
- A sterile plaster was then applied to the area.
- This was repeated at regular fortnightly intervals on 3 occasions.
- After each treatment, the patient was advised not to take anti inflammatories for 6 weeks after his last injection.
- He was advised to rest the elbow completely for 2 weeks and then gradually go back into normal activity. He was also advised to continue with his rehabilitation exercises.

RESULTS

No serious adverse side effects were experienced by the patient. Mild side effects were stated as mild pain and swelling in the area for 12 hours.

At the 4 weeks follow up, the patient reported no worsening of symptoms but only noticed mild improvement in pain and function. At 8 weeks follow up the patient reported a 50% improvement (4/10 VAS score) and stated that it was the best his elbow had felt in 2 years. At 12 weeks follow up, the patient reported a 90% improvement (1-2/10 VAS score) in pain and stated he was able to paddle board and kite surf again without flaring his elbow up, showing a much-improved state of function. On repeating the Oswestry disability assessment, he scored a 4, which showed a very mild but negligible disability.

DISCUSSION

The results of this study were very positive, with significant improvements in health status of the condition both in pain and function. The patient satisfaction level was very high anecdotally. Of course, this was a case study of a single participant so any scientific conclusions cannot be made.

Certain variables can be considered, however. Placebo is a significant contributor to health outcomes (Howe et al. 2017, McCarter 2020), suggesting adherence to protocols, patient expectations and practitioner behaviour can have a significant effect. It was explained to the patient that the PRP treatment was not guaranteed to work, but the patient had read anecdotally that PRP had been effective in many cases of tennis elbow, so did have high expectations.

The use of dry needling in the procedure is also a significant variable. As a stand-alone treatment, dry needling has been shown to be an effective treatment for tennis elbow (Navarro-Santana et al. 2020), posing the question, how much of the improvement was due to

the PRP. The fact that the patient had received dry needling in the past, during his first cortisone injection session and still had a return of symptoms, leans toward the PRP having a significant impact on the final outcome.

One of the main challenges with PRP currently is the vast spectrum of outcomes in the scientific literature (Grassi et al. 2018, Filardo et al. 2020), which could be due to an array of issues such as study design, bias, conflict of interest and the type of PRP method used. It is suggested that the quality and effectiveness of PRP has improved a lot since the days of using a simple buffy coat system, yet still varies considerably between systems (Oudelaar et al 2018). Until a standardised system is agreed upon, health outcomes will remain varied.

Although not backed by peer reviewed evidence, clinical evidence of the tropocells system, with its patented separation system appears to be effective in both removing red blood cells and neutrophils which are associated with catabolism and inflammation, whilst maintaining the platelets and monocytes whish are associated with healing (Estar medical 2021). But until this is evaluated scientifically, little conclusion can be made from this.

Comparing PRP to cortisone in the treatment of lateral epicondylitis, it has been suggested that cortisone is more effective for pain relief in the short term (2-8 weeks) but is superseded by PRP at the 12 weeks point for a longer lasting effect (Mi et al. 2017). This should be taken into consideration when choosing an intervention according to patient needs. This, in combination with the possible side effects of repeated cortisone injections (Haraldsson et al. 2006) suggests that PRP is a valid consideration versus cortisone for treatment of tennis elbow, yet because of their opposing actions, should not be used together.

Comparing PRP to hyaluronic acid (HA), studies show that both have better outcomes than placebo groups (Krough et al. 2012), and that both can alleviate pain symptoms in the medium term. The main difference appears to be the improvement of function & strength achieved with PRP was not as significant with HA (Kaux et al 2019). But research in this area is lacking and more data is needed before any conclusions are made. From a cost perspective, HA seems to be slightly more cost effective anecdotally and has a wider availability on the NHS. It is also common practice to use HA and PRP together, especially in intra articular injections, as the combination has been shown to achieve a better function score than HA or PRP alone (Zhao et al 2020).

CONCLUSION

The current price constraints of PRP and its limited availability on the NHS and through health insurance companies, leaves it for those who can afford it. The varied systems available, methods of intervention and varied protocols leave PRP open to wildly varied results, which will ultimately hinder its progress in the acceptance as a mainstream intervention. More studies are needed in all aspects of PRP to help fine tune these methods and protocols, and to find a standardised way of practice. The available research shows a promising intervention with good outcomes and very few side effects, which if occur, are usually associated with the anticoagulant ingredients rather than the autologous substances (Latalski et al 2019). Over time it is likely that the cost of PRP will reduce in combination with wider availability on the NHS and privately, making it a safter, longer lasting, and more cost-efficient treatment for tennis elbow as well as other musculoskeletal conditions.

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