Case Study: The Use of Neuromuscular Electro-stimulation during Rehabilitation Post Osteoarticular Transfer System Surgery in a Professional Football Player.

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Subject

The subject is a 19-year-old male professional football player.

Injury History

The player reported chronic right ankle stiffness post training sessions believed to be due to a previous ankle inversion injury whilst an Academy player. A 1cm osteochondral defect of the talus with subchondral oedema and synovitis was observed on MRI. The subject underwent osteoarticular transfer system surgery and began a rehabilitation protocol.

Clinical Presentation and Rationale for NMES

Following commencement of running sessions the player had a severe inflammatory response in the injured ankle with significant swelling around the lateral and medial malleolus. Following an MRI scan no further implications were evident and the player continued to progress with the rehabilitation.

The aim of using Neuromuscular Electro-stimulation (NMES) device was to aid recovery post ankle loading and reduce swelling around the ankle joint. The NMES device was chosen for evaluation as research shows this method to be effective at increasing blood circulation and reducing oedema[4]. A previously published study also demonstrates positive psychometric and physiological benefits in professional athletes post training[1].

Protocol

The player completed two standardized running sessions within seven days as part of his planned recovery, and on the second session the NMES was used and evaluated. The day before each running session the player was given a day off to recover from the rehabilitation work. The player also completed a standardized muscle activation and warm up procedure before each run and followed the same recovery protocol post session with the exception that the NMES device was applied to both legs and worn for 6 hours after the second session.

Subjective markers were measured on a 0 – 5 scale (0 – Tired/Fatigued/Pain, 5 – Fresh/No Pain). The scale was used due to the player being familiar with the scoring system as it was used by the Club as part of daily squad monitoring. The subjective measures were taken using a semi-structured interview where the player was asked their perception of general fatigue and muscle soreness, ankle swelling, ankle soreness, ankle range of motion (ROM), calf soreness, knee soreness (donor site), plantar/foot pain and any additional comments they considered relevant.

Three objective markers were also used to measure the ankle swelling and ankle ROM. These were the figure of 8 measurement[2], malleolus girth and knee to wall (KTW). The data was collected as per normal department protocol in the morning prior to the player completing any rehabilitation work and 24 hours post the running sessions.

Results

Table 1 illustrates the subjective and objective measures between the two sessions. The results show an improvement in the subjective measures reported by the athlete, in particular the athletes perception of ankle swelling improved. There were also slight improvements in the perception of general soreness, specific ankle soreness and stiffness.

For the objective measurements taken Figure of 8 measurements remained similar for both conditions. Malleolus girth increased 24 hours post in both the control and experimental conditions. However, after the control condition malleolus girth increased by 1.2cm on the injured side compared to an increase of 0.8cm in the experimental condition (Table 1).

Table 1 – Objective Measures and Athlete Subjective Ratings

Measures		**Running session 1, standard recovery protocol**		**Running session 2, standard recovery protocol + NMES**	
		Pre	**Post**	**Pre**	**Post**
Knee To Wall		7cm	8cm	8cm	7.5cm
Figure of 8		56.5cm	56.7cm	56.7cm	56.5cm
Malleolus Girth		27.2cm	28.4cm	27cm	27.8cm
General	**Fatigue**	3	3	3	4
	Soreness	3	3	3	4
Ankle	**Soreness**	3	3	3	4
	Stiffness	3	2	3	3
	Swelling	4	2	3	4
	ROM	4	4	4	4
Calf	**Soreness**	4	3	3	3
Knee	**Soreness**	4	4	4	4
Plantar	**Soreness**	4	4	4	4

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Fig. 1 Ankle photographs taken 24hrs post-running session (Control Condition)

Fig. 2 Ankle photographs taken 24hrs post-running session and use of NMES device (Experimental Condition)

Further to the results shown in Table 1 when asked for any additional comments after the experimental condition the athlete also reported *"My legs feel very fresh. My ankle feels much better than last time after I ran."*

Conclusion

The results demonstrate the use of the NMES device, as an additional recovery protocol during the rehabilitation process may be beneficial to athletes following an increase in loading or the commencement of running sessions post long-term lower limb injury. The device was well tolerated and the athlete reported improved subjective measures for the injured ankle, in conjunction with some improvements in objective markers of ankle swelling.

The importance of subjective improvements during an injury has been well documented and plays an important role in an athlete's progression during rehabilitation and, ultimately, a return to

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competition[3]. In particular, the athlete must have significant confidence in their ability to perform and cope with the demands of their sport following a long-term injury.

It is plausible that the improvements in subjective measures in the experimental condition may be related to the reduction in ankle swelling following the use of the NMES device, as there were no parallel improvements in the athletes' subjective measures for calf, knee and plantar soreness. Therefore, the positive effect of the NMES device to reduce ankle swelling along with the improvements in perceived post exercise soreness, as shown by the general fatigue and soreness scores, are important to consider.

Further examination is required in the area with a larger population as the results from this case study cannot be generalized. Further to this, research is required to establish the long-term effect of NMES use as a recovery protocol in rehabilitation programs and the effects with different types of injury. However, this case study shows NMES could play an important role in injury rehabilitation and athlete's return to play protocols.

References

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