Case reports

Successful management of a professional viola player with a complex playing related musculoskeletal disorder

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Abstract

Objective

This paper presents the case of a 53-year-old female professional violist with chronic disabling neck and shoulder pain who had failed standard conservative management. A multimodal approach including Mulligan Concept manual therapy techniques resulted in a successful return to the workplace.

Methods

Mobilization with Movements and Sustained Natural Apophyseal Glides as part of Mulligan Concept manual

therapy approach, were the main treatment techniques utilized. Neuro-dynamic exercises, strengthening exercises, ergonomic interventions, alterations in playing load, and posture training were also implemented. Pain, range of motion and disability levels were monitored throughout treatment.

Results

Significant improvements were seen in both neck and shoulder range of motion alongside considerable pain reduction in both regions. Clinically meaningful improvements were also noted in Neck Disability Index and Shoulder Pain and Disability Index scores.

Discussion

Ergonomic intervention with postural correction and replacement with a lighter viola also contributed to patient recovery and return to the workplace. The Mulligan approach has proved to be effective in a wide variety of conditions. Still, it has not previously been considered in managing complex neck and upper limb dysfunctions in string players.

Conclusion

This paper highlights how an intensive manual therapy program had better results compared with standard conservative management. Multimodal intervention with occupational, ergonomic, and physiotherapy approaches was effective, leading to progressive re-integration into the workplace. Mulligan Concept manual therapy techniques should be considered in the management of playing related musculoskeletal disorders.

Keywords: *upper limb, musculoskeletal disorders, string players, Mulligan Concept*

Introduction

Professional instrumental musicians represent a unique occupational category. Playing related musculoskeletal disorders (PRMDs) have a high prevalence in instrumental musicians, estimated to be as high as 80% [1,2]. In some cases, PRMDs may result in abandonment of the musician's profession [3].

The multifactorial etiopathogenesis of PRMDs includes exposure to biomechanical, individual and non-physical psychosocial stressors [4, 5]. Specific and excessive loads on the musculoskeletal system could affect musicians since the beginning of learning to play an instrument, which for most signifies childhood [6]. Professional musicians require high levels of motor control, muscle performance, coordination and endurance to perform at the highest standards. The high demands of practice and performance may result in the development of PRMDs [7]. Management of PRMDs is recommended to involve a thorough assessment and treatment using education and advice, postural correction, targeted exercise programs and other strategies including rest and a graded return to playing [8]. Occupational physicians, ergonomists and physiotherapists are commonly involved in the treatment of PRMDs depending on which model of care is used, with physiotherapy management being recommended for the management of PRMDs [9]. The Mulligan Concept is a manual therapy approach commonly used by physiotherapists that addresses pain, range of motion (ROM) deficits and movement dysfunction [10]. Our case study analyzes the

assessment, management and successful return to work of a professional viola player with a complex PRMD.

Material and method

Our paper presents a 53-year-old woman, with 30 years' experience as a professional viola player in the local philharmonic orchestra, who addressed the Occupational Medicine Clinic with a four-month history of left shoulder pain. The medical and occupational history highlight the occupational risk factors. Clinical and neurological exams, ultrasonography, computer tomography (CT), magnetic resonance imaging (MRI) and nerve conduction (NC) were performed. Treatment consisted of specific physiotherapist interventions using the manual Mulligan concept: Mobilization with Movements (MWM) for the shoulder and Sustained Natural Apophyseal Glides (SNAGs) for the cervical spine. These Mulligan Concept techniques combine mobilisation with active movement resulting in pain free movement and improved function. [11] Clinical evolution was recorded using Neck Disability Index (NDI) and Shoulder Pain and Disability Index (SPADI). Ergonomic intervention was also performed.

The patient provided written informed consent regarding the publication of the medical data and images of the case.

The study was conducted ethically in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki). The study was approved by

the Local Ethics Commission for Scientific Research of University of Medicine and Pharmacy „Victor Babes” Timisoara, Romania; (approval no. 24/03.04.2020).

Results

Patient information

The onset of symptoms occurred after a five-minute viola solo and led to the patient being unable to perform her work as a musician. Previous management with non-steroidal anti-inflammatory drugs and electrotherapy procedures for four months, was unsuccessful, with poor results and patient dissatisfaction. A past history of intermittent cervical pain which did not require any medical assistance was noted. There was no recent or past history of trauma. A three-year history of essential hypertension controlled with medication and no significant family medical history were declared. Chronic smoking (30 years, 15 cigarette/day) was reported.

The patient's working program showed a significant increase in the intensity of professional activity (4 hours of orchestra training per day, 3 hours of individual practice per day and 2 hours of concert twice per week) in the past three years. Several intense European tours and frequent bus trips preceded the onset of the patient's symptoms.

Work posture and repetitive movements, ergonomic factors (chair type and viola weight), microclimate, vibration, neurophysiological stress and non-physical psychosocial stressors were the occupational risk factors identified and analyzed.

Clinical findings

During the first visit in physiotherapy unit, observation revealed left rotator cuff muscle atrophy, hyperextended lumbar spine, flat thoracic spine, a forward head posture with head in right side flexion, bilateral downwardly rotated scapulae, an elevated left shoulder girdle with the left arm held in extension and internal rotation. A clinical neurological examination revealed no deficit in terms of power, reflexes or sensation loss. The ulnar nerve was painful on palpation and had a positive Tinel's test at elbow level. Spurling's test, the distraction test and upper limb neurodynamic tests were performed to screen for radiculopathy and were found to be normal. The elevated arm stress test, used to screen for neurogenic thoracic outlet syndrome, was negative.

Diagnostic assessment

Imaging (Figure 1) and electrophysiological tests were performed, with electromyography and nerve conduction studies showing reduced velocity consistent with a focal ulnar nerve neuropathy.

Figure 1. Performed imaging and electrophysiological tests

An initial diagnostic hypothesis of rotator cuff syndrome, peripheral mechanical sensitization of C5-C6, and cubital tunnel syndrome was made and the patient was referred for both specialized musculoskeletal assessment and rehabilitation with a physiotherapist, and ergonomic intervention.

Therapeutic Intervention

Physiotherapy intervention initially involved education regarding the pathology, treatment plan and gradual resumption of Activities of Daily Living

(ADLs) and playing activities, along with correction of sitting and sleeping posture. MWMs and SNAGs were used for pain reduction and ROM improvement. Self-treatment using self-MWMs of shoulder and self-SNAGs of the neck were prescribed (Figure 2). In the first six weeks, three sessions per week of shoulder MWMs and cervical SNAGs were performed. An average of 3 sets of 6 to 10 repetitions of shoulder MWMs were performed using initial range techniques (Figure 2 a, b).

Figure 2. Self-treatment using self-MWMs of shoulder and self-SNAGs of the neck

Over the course of the first six weeks, the multidirectional loss of active range of motion (AROM) and equivalent loss of passive range of motion (PROM) of the left shoulder, made the treating medical professionals reconsider the initial diagnosis of rotator cuff syndrome, and the patient was instead diagnosed with frozen shoulder syndrome.

When pain and ROM improved patient progressively started to play the viola for 5-10 min/day. At this point the occupational physician recommended an ergonomic chair suitable for the instrument, choosing a lighter viola and recreational time between playing sessions. The patient's viola, weighing 800g, was replaced with another viola with a weight of 700g.

Patients posture on her playing chair was assessed and modified.

Frequency of sessions at this stage reduced to two treatments weekly for another 3 weeks and then to one session per week. As ROM increased and pain intensity reduced, MWM techniques for middle range were added for combined movements and self MWMs with a belt were prescribed (Figure 2 c, d, f). End range techniques for ROM restoring were finally added (Figure 2 e). Scapular repositioning and rotator cuff muscle strengthening exercises were prescribed as home program during this period.

Symptoms related to the cubital tunnel syndrome were initially mild and not the patient's main concern,

thus no treatment was initially given for these symptoms. Neurodynamic home exercises for ulnar nerve were prescribed at a later session: shoulder self-mobilizations for inhibiting levator scapulae dominance, isometric subscapular contractions in the functional range, adduction exercises for the shoulder girdle, self-internal rotation mobilization

with towel under the axilla, training of the scapulo-thoracic muscles, posture training, self-neck traction, infraspinatus isometric contraction and closed chain rotator cuff dynamic training [11].

Follow-up and Outcomes

The patient completed the SPADI and NDI questionnaires.

Table 1. The measured variables after treatment

	Baseline			6 weeks			12 weeks			20 weeks		
SHOULDER ROM	VAS PAIN	AROM (°)	PROM (°)	VAS PAIN	AROM (°)	PROM (°)	VAS PAIN	AROM (°)	PROM (°)	VAS PAIN	AROM (°)	PROM (°)
Flexion	9/10	100	110	6/10	130	140	4/10	140	150	2/10	170	180
Abduction	9/10	80	90	6/10	80	100	5/10	120	140	2/10	160	170
Horizontal Adduction	5/10	10	10	4/10	10	20	3/10	20	30	0/10	20	30
External rotation	5/10	15	15	4/10	20	30	2/10	40	60	1/10	70	80
Internal rotation	10/10	0	5	7/10	10	20	6/10	30	50	1/10	60	60
Extension	6/10	20	30	3/10	20	40	3/10	30	40	0/10	40	45
CERVICAL ROM	VAS PAIN	AROM		VAS PAIN	AROM		VAS PAIN	AROM		VAS PAIN	AROM	
Flexion	2/10	30		2/10	30		2/10	40		1/10	40	
Extension	4/10	20		3/10	30		3/10	30		2/10	40	
Left rotation	3/10	20		2/10	30		2/10	40		1/10	40	
Right rotation	1/10	50		1/10	50		0/10	60		0/10	60	
Left side flexion	3/10	10		2/10	20		2/10	30		1/10	30	
Right side flexion	1/10	20		1/10	20		0/10	30		0/10	30	
QUESTIONNAIRE	%			%			%			%		
SPADI Pain Score	94%			76%			52%			28%		
SPADI Disability Score	86%			66%			45%			20%		
SPADI total score	89%			71%			48%			24%		
NDI Score	58%			36%			16%			12%		

ROM - range of motion; VAS - visual analogue scale; AROM - active range of motion; PROM - passive range of motion; SPADI - shoulder pain and disability index; NDI - neck disability index

Over the course of treatment clinically significant improvements were observed in all variables measured (Table 1). The patient adhered to self-management exercises throughout the course of treatment. There were no adverse effects of treatment reported and no unanticipated events.

After 6 weeks of treatment gradual return to

activity (5-10 minutes/day) with breaks between training sessions were encouraged. As symptoms decreased after 5 months of manual physiotherapy, 2 hours-playing sessions and 20 minutes-breaks were recommended and the patient was able to return to workplace.

Discussion

This case report describes the successful management of a complex, chronic PRMD involving the combination of frozen shoulder, peripheral mechanical sensitization of C5-C6, and ulnar tunnel syndrome in a professional viola player. Multiple factors are likely to have contributed to the development of this PRMD, of which the professional ones bear a decisive role, through 41 years of playing the viola.

This case underlines the distribution of symptoms in female string players who are more at risk to develop PRMDs than male string players, with left side upper limb being predominant [12].

Chan and Ackermann advocate for an evidence informed based approach in case of PRMDs and the role of advice, education, posture corrections and specific physiotherapy for better outcomes [9]. These interventions were performed with this patient. More specifically, education and advice regarding postural correction, pathology, treatment plan and the progressive resumption of ADLs including a gradual return to playing were provided.

Viola players reported more pain than violinists in the left upper limb which is associated with the greater weight and size of their instrument [13]. When playing the viola, the seating position of the body compels the spine to rotate while the left upper limb is required to support the weight of the instrument, leading to an increased level of PRMDs in viola players [14]. In this case adjusting the size and weight of the patient's viola for a smaller viola weighing less is likely to have contributed to the positive outcome observed in this patient.

Unfortunately, due to late patient presentation in the Occupational Health Department, the patient's professional performance was compromised, resulting in the cessation of her work. This is consistent with literature showing that professional musicians often continue to work with pain and discomfort [1]. Physiotherapy management mainly consisted of Mulligan techniques including MWMs and SNAGS. MWMs have previously been shown to be effective in the management of shoulder disorders [15]. This case study is the first reported case of Mulligan Concept techniques being used successfully in the management of a professional musician with a complex PRMD.

The patient reported being satisfied with treatment as it was effective, targeting both her personal demands and professional functional needs. As we

couldn't exclude the improvements achievement as being the result of a natural course for the patient recovery, future research considering the usage of MWMs in professional musicians in more depth is indicated.

Conclusion

This case is an example of how a multimodal approach including education, physiotherapy and occupational intervention in the management of a complex PRMD led to the patient's return to the workplace.

String players and other musicians presenting upper limb PRMDs are likely to benefit from a multidisciplinary treatment approach from the commencement of symptoms for better outcome and earlier work return.

Given the success involving Mulligan Concept manual therapy techniques in this case, and the possible improvements due to MWMs, they should be considered in string players and other musicians with complex PRMDs.

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Statement of ethics

The study was conducted ethically in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki). The study was approved by the Local Ethics Commission for Scientific Research of University of Medicine and Pharmacy „Victor Babes” Timisoara, Romania; (approval no. 24/03.04.2020).

Consent for publication

The patient provided written informed consent regarding the publication of the medical data and images of the case. Physiotherapist also provided written consent for photo publication.

Conflict of Interest

Grant Mackay teaches the Mulligan Concept in postgraduate physical therapy courses, for which he receives a teaching fee. All other authors have no

conflict of interests to declare.

References

1. Stanhope J, Tooher R, Pisaniello D, Weinstein P. Have musicians' musculoskeletal symptoms been thoroughly addressed? A systematic mapping reviews. *Int J Occup Med Environ Health* 2019;32(3):291-331. <https://doi.org/10.13075/ijomeh.1896.01340>
2. Rotter, G., Noeres, K., Fernholz, I., Willich, S. N., Schmidt, A., & Berghöfer, A. musculoskeletal disorders and complaints in professional musicians: a systematic review of prevalence, risk factors, and clinical treatment effects, *Int Arch Occup Environ Health* 2020;93 (2):149-187. <https://doi.org/10.1007/s00420-019-01467-8>
3. Cruder C, Barbero M, Koufaki P, Soldini E, Gleeson N (2020) Prevalence and associated factors of playing-related musculoskeletal disorders among music students in Europe. Baseline findings from the Risk of Music Students (RISMUS) longitudinal multicentre study. *PLoS ONE*. 15(12): e0242660. <https://doi.org/10.1371/journal.pone.0242660>
4. Roquelaure Y. Musculoskeletal disorders and psychosocial factors at work. *SSRN Electron J* 2019. <https://doi.org/10.2139/ssrn.3316143>
5. Sousa CM, Machado JP, Greten HJ, Coimbra D. Occupational diseases of professional orchestra musicians from northern Portugal: A descriptive study. *Med Probl Perform Art* 2016;31(1):8-12. <https://doi.org/10.21091/mppa.2016.1002>
6. Jacukowicz A. Psychosocial work aspects, stress and musculoskeletal pain among musicians. A systematic review in search of correlates and predictors of playing-related pain. *Work* 2016;54(3):657-668. <https://doi.org/10.3233/WOR-162323>
7. Schemmann H, Rensing N, Zalpour C. Musculoskeletal Assessments Used in Quantitatively Based Studies About Posture and Movement in High String Players: A Systematic Review. *Med Probl Perform Art* 2018;33(1):56-71. <https://doi.org/10.21091/mppa.2018.1009>
8. Davies J. Alexander Technique classes for tertiary music students: Student and teacher evaluations of pre- and post-test audiovisual recordings. *International Journal of Music Education* 2019;38(2):025576141988000. <https://doi.org/10.1177/0255761419880007>
9. Chan C, Ackermann B. Evidence-informed physical therapy management of performance-related musculoskeletal disorders in musicians. *Front Psychol* 2014;8;5:706. <https://doi.org/10.3389/fpsyg.2014.00706>
10. Hing W, Hall T, Mulligan B. The Mulligan Concept of Manual Therapy. *Textbook of Techniques*. 2nd ed. Elsevier, 2019
11. Shafer-Crane GA. Repetitive stress and strain injuries: preventive exercises for the musician. *Phys Med Rehabil Clin N Am* 2006;17(4):827-42. <https://doi.org/10.1016/j.pmr.2006.07.005>
12. Kochem FB, Silva JG. Prevalence of playing-related musculoskeletal disorders in string players: A systematic review. *J Manipulative Physiol Ther* 2018;41(6):540-549. <https://doi.org/10.1016/j.jmpt.2018.05.001>
13. Rensing N, Schemmann H, Zalpour C. Musculoskeletal demands in violin and viola playing: A literature review. *Med Probl Perform Art* 2018;33(4):265-274. <https://doi.org/10.21091/mppa.2018.4040>
14. Ohlendorf D, Marx J, Clasen K, et al. Comparison between the musician-specific seating position of high string bow players and their habitual seating position - A video raster stereographic study of the dorsal upper body posture. *J Occup Med Toxicol* 2018;13(1). <https://doi.org/10.1186/s12995-018-0217-6>
15. Satpute KH, Bhandari P, Hall T. Efficacy of hand behind back Mobilization with Movement for acute shoulder pain and movement impairment: A randomized controlled trial. *J Manipulative Physiol Ther* 2015;38(5):324-34. <https://doi.org/10.1016/j.jmpt.2015.04.003>