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Wpływ treningu wibracyjnego na jakość przepływu żylnego w obrębie naczyń kończyn dolnych u dzieci z mózgowym porażeniem dziecięcym

The effect of vibration training on the quality of venous flow in the lower limb vessels in children with cerebral palsy

Biodro trzaskające wewnętrznie w ocenie ultrasonograficznej

Internal snapping hip on ultrasound

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Myofascial release; a diagnostic tool for knee-abdomen and knee myofascial pain syndromes in knee osteoarthritic patients. An interventional based prevalence study

Terapia mięśniowo-powięziowa jako narzędzie diagnostyczne w zespołach bólu mięśniowo-powięziowego kolana i brzucha oraz zespołach bólu mięśniowo-powięziowego kolana u pacjentów z chorobą zwyrodnieniową stawu kolanowego. Badanie interwencyjne oparte na ocenie częstości występowania

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Abstract

Background. Knee osteoarthritis (OA) is detected in all grades in imaging of asymptomatic individuals. Knee-abdomen syndrome (KAS) and knee myofascial pain syndrome (KMPS) are newly identified syndromes of knee pain originating from myofascial induced stress upon knee's capsule. Objective. To measure prevalence of KAS and KMPS among knee OA patients, and to explore concepts of the new syndromes. Methods. Intervention based prevalence study. Representative sample of 61 patients (pts) of knee OA underwent one session of Myofascial release (MFR). Pain was evaluated and averaged pre and immediately after MFR, during standing, active knee flexion and extension, and squat. Pain reduction of 50% is considered diagnostic for KMPS and KAS. Pain reduction maintained for one week is diagnostic for KAS. Results. KAS and KMPS are reconstructed as knee myofascial pain spectrum (KMPs). 13% of patients have KMPs and asymptomatic OA with 100% pain reduction after MFR. 20% of pts have symptomatic OA with no pain reduction. 67% have KMPs with more than 20% pain reduction. Conclusion. KMPs is identified in most knee OA patients. Asymptomatic knee OA is misdiagnosed as source of pain in one in every ten patients.

Keywords

osteoarthritis, knee-abdomen syndrome, knee myofascial pain syndrome, knee myofascial pain spectrum, myofascial release, myofascial dysfunction

Streszczenie

Tło. Choroba zwyrodnieniowa stawu kolanowego (OA) jest wykrywana we wszystkich stopniach zaawansowania w obrazowaniu u osób bezobjawowych. Zespół kolano-brzuch (KAS) i zespół bólu mięśniowo-powięziowego kolana (KMPS) to nowo zidentyfikowane zespoły bólu kolana, wywodzące się ze stresu mięśniowo-powięziowego wywieranego na torebkę stawu kolanowego. Cel. Zmierzenie częstości występowania KAS i KMPS wśród pacjentów z OA kolana oraz zbadanie koncepcji nowych zespołów. Metody. Badanie interwencyjne oparte na ocenie częstości występowania. Reprezentatywna próba 61 pacjentów z OA kolana przeszła jedną sesję terapii mięśniowo-powięziowej (MFR). Ból był oceniany i uśredniany przed oraz bezpośrednio po MFR, podczas stania, aktywnego zginania i prostowania kolana oraz przysiadu. Redukcja bólu o 50% jest uznawana za diagnostyczną dla KMPS i KAS. Utrzymanie redukcji bólu przez tydzień jest diagnostyczne dla KAS. Wyniki. KAS i KMPS zostały zrekonstruowane jako spektrum bólu mięśniowo-powięziowego kolana (KMPs). 13% pacjentów ma KMPs oraz bezobjawową OA z 100% redukcją bólu po MFR. 20% pacjentów ma objawową OA bez redukcji bólu. 67% pacjentów ma KMPs z redukcją bólu powyżej 20%. Wnioski. KMPs zostało zidentyfikowane u większości pacjentów z OA kolana. Bezobjawowa OA kolana jest błędnie diagnozowana jako źródło bólu u jednego na dziesięciu pacjentów.

Słowa kluczowe

choroba zwyrodnieniowa stawów, zespół kolano-brzuch, zespół bólu mięśniowo-powięziowego kolana, spektrum bólu mięśniowo-powięziowego kolana, terapia mięśniowo-powięziowa, dysfunkcja mięśniowo-powięziowa

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Introduction

Knee osteoarthritis (OA) is a prevalent contributor to global disability [1], with 303 million cases of knee and hip OA diagnosed globally[1]. Radiographic imaging is a cornerstone of orthopedic medicine diagnostics [2]. Spinal diagnostics model underwent a major paradigm shift in our current century based on finding of pathoanatomical features in asymptomatic individuals [3]. The medical diagnostic model changed to relabel most cases of low back pain (LBP) as non-specific LBP, as imaging cannot reliably identify the structural cause of LBP [4-7], Creating a new dysfunction/impairment-based diagnostic/classification guidelines for neck and back [8-11]. The dysfunction/impairment-based diagnostics fills up the knowledge gap of spinal pain causes, guiding to a better treatment and clinical decision making.

Pathoanatomical findings are detected in 97% of asymptomatic knees [12], with disproving evidence that mild conditions only exist asymptomatically. Grade 4 knee osteoarthritis is detected asymptomatically [13]. A new multiple case study defined knee pain based on dysfunctional myofascial continuity (deep front line) attached to knee capsule [14]. Defined two new syndromes termed knee-Abdomen (KAS) and knee myofascial pain (KMPS). The first one describes purely passive stress on the knee capsule through a hypomobile surgical incision, while the second one describes passive stress through myofascia combined with muscle (MS) imbalance. This study explores the concepts provided by the new syndromes and their prevalence within patients (pts) diagnosed with knee OA.

Subjects and methods

Design

An intervention based prevalence study was conducted to report and explore the newly reported KMPS and KAS [14] in knee OA population. Pain reduction of 50% after one session of myofascial release (MFR) was considered diagnostics for KMPS and KAS. Pain recurrence within one week is diagnostic for KMPS, as it includes MS imbalance, that is not addressed through MFR, causing pain recurrence. Persistent pain reduction over 1 week was considered diagnostic for KAS. Based on Mohamed et al. [14].

Myofascial release was performed upon the Deep front line (DFL).

- Passive release was performed by stroking the targeted structure in a longitudinal slow manner, aiming to mobilize fascia over muscles or fascial layers over each other. It was performed for tibialis posterior, flexors hallucis and digitorum longus, pes anserine, adductors of the hip and related intramuscular septa.
- Active release was performed by applying a force to the targeted myofascial structure, aiming to immobilize fascia while muscle contracts.. It was performed for iliacus and psoas major.
- Separation technique was performed by applying a perpendicular force to the targeted structure to allow mobility within. It was performed upon the hip adductors, to restore intermuscular mobility of gracilis, adductor longus, brevis and magnus.
- Special form release was performed by

– Release of quadratus lumborum (QL): Therapist's hand hooks around the QL through compression of the lateral abdominal wall with posteriorly directed motion, until contact is established with anterior surface of QL, and pulls it posteriorly and maintains a pressure on its anterior surface. Therapist's other hand brings the pelvis into side bending, lengthening the QL muscular tissue under the relatively immobilized QL's fascia.

– Release of the diaphragm: Therapist's fingers are inserted into the lower costal margin to contact the lowest part of the diaphragmatic myofascia. Ribs pulled slightly laterally to expand the chest & maintaining relative immobilization contact on the myofascial structure. Patient is instructed to continue breathing regularly for five breaths.

– Release of the abdominal fascia: Fingers are inserted behind the rectus abdominis muscle as deep as possible, with an anteriorly directed lift of the umbilicus performed, while the patient is instructed to take deep five breaths.

– Form release of the abdominal fascia. Hands are placed on the abdomen, maintaining downward force equivalent to the weight of the therapist's upper limbs. Patient is instructed to keep breathing normally, while the position is maintained for 3 minutes. The technique aims to reflect diaphragmatic breathing force to mobilize abdominal fascia.

All passive, active and separation releases were performed 5 times per area of myofascial contact. All techniques utilized in the study was identical to the illustrated techniques by Mohamed et al [14], except direction of adductor septa release was directed to the knee joint, not away from it.

Participants

This study was set to 66 cases medically diagnosed with knee OA. The appropriate sample size with sufficient power was calculated by the Epi Info, a program developed by the Centers for Disease Control and Prevention. The population size was specified as 4610 per 100,000 for North Africa and Middle East according to global prevalence of OA [1]. Sample size calculation was 56 at 95% confidence interval. For an expected 10% drop off rate, sample size was increased by 10 cases to 66.

Inclusion criteria

- Medical diagnosis of knee OA by an orthopedist or rheumatologist. Based on Kellgren and Lawrence grading [15].
- All grades of knee OA were included in the study.
- Age limit was set to 18 years; as adult based study, with no upper limit, as knee OA is present asymptomatically across different ages and grades [12, 13, 16].

Exclusion criteria

- Concomitant presence of any medical condition that can cause knee pain with OA.

Experimental Procedures

- Pain level was measured pre and post every MFR session.
- Numerical pain rating scale (NPRS) is utilized for pain measurement.
- Pain aggregation of four positions is used as the main outcome of the study. Pain aggregation is calculated as the average pain reduction of the four positions.

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– Standing
– End-range active knee extension
– End-range active knee flexion
– Maximum depth squats up to 90-degree or until pain reaches 10/10

Outcome measures

Pain was measured using arabic version of numerical pain rating scale (NPRS). The NPRS is an 11-point scale comprising a number from 0 through 10; 0 indicates "no pain", and 10 indicates the "worst imaginable pain". Patients are instructed to choose a single number from the scale that best indicates their level of pain [17, 18]. Arabic version of NPRS is a valid and reliable pain rating scale [18].

Statistical analysis

Data was analyzed using descriptive as well as inferential statistics including frequency distributions, mean, standard deviation (SD), and confidence interval (CI). The analysis was done using Microsoft Excel with the appropriate equations for the targeted data analysis to have an inference about prevalences including point prevalence which is the frequency of existing cases in the defined population at the time of data collection [19].

Results

Demographic data

Sixty-six knee OA pts were recruited for the study. Five patients didn't complete their follow up. The final sample size was 61 pts. Their demographic data are represented (Table 1).

Table 1. Demographic characteristics of knee osteoarthritis patients

Age	
Ranged from 39 to 77 years	Average of 56.6 (±9.8)
Gender	
Male	**Female**
Number: 10	Number: 51
Percentage: 16.4%	Percentage: 83.6%

Fifty percent pain reduction was the minimal level considered positive for the existence of myofascial dysfunction; based on Mohamed et al [14]. Patients who didn't experience pain reduction over 50% reported improvement and satisfaction from the treatment. Therefore, three-point prevalences are calculated based on different cut-off values of 50%, 100% and 20% pain reductions. For each pain reduction point prevalence (PP) numerical data and percentage are presented, and percentage of pain recurrence within 1 week (Table 2).

Table 2. Prevalence and recurrence of pain reduction in knee osteoarthritis patients after myofascial release

	# of pts. With pain reduction over the cut-off value	% of pts. with pain reduction over the cut-off value	# of pts. with pain recurrence within 1 week	% of pts. with pain recurrence within 1 week	# of pts. without pain recurrence within 1 week	% of pts. without pain recurrence within 1 week	% of pts. within cut-off with pain recurrence within 1 week	% of pts. within cut-off without pain recurrence within 1 week
20% cut-off	49	80.33	20	32.79	29	47.54	40.82	59.18
50% cut-off	29	47.54	11	18.03	18	29.51	37.93	62.07
100% cut-off	8	13.11	2	3.28	6	9.84	25	75

Point prevalence of knee myofascial pain based on 50% cut-off is 47.54%, With 95% confidence that PP of knee myofascial pain lies between 35.01% and 60.07%. Based on 100% cut-off PP is 13.11%, With 95% confidence that PP of knee myofascial pain lies between 4.64% and 21.59%. Based on 20% cut-off PP is 80.33%, With 95% confidence that PP of knee myofascial pain lies between 70.35% and 90.30%.

Knee OA is reported in North Africa and Middle East 4610 per 100,000[1], estimation of pts with knee myofascial pain based on 50% cut-off to be 2191.6, With 95% confidence that pts number lies between 1613.9 and 2769.4 per 100,000. Based on 100% cut-off to be 604.6, With 95% confidence that pts number lies between 214.1 and 995.1 per 100,000.. Based on 20% cut-off to be 3703.1, With 95% confidence that pts number lies between 3243.2 and 4163.0 per 100,000.

Table 3. Number and percentage of pain presence per position for every cut-off value

		Standing	End range active flexion	End range active extension	90° squat
20% cut-off (Total number 49)	**Number**	21	33	31	49
	Percentage	42.86	67.35	63.27	100
50% cut-off (Total number 29)	**Number**	9	15	15	29
	Percentage	31.03	51.72	51.72	100
100% cut-off (Total number 8)	**Number**	1	0	2	8
	Percentage	10	X	20	100

Off 100% cut-off no patient had pain in end range active flexion, therefore there's no percentage of pain reduction.

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Table 4. Average percentage of pain reduction of different positions for every cut-off value

	Standing	End range active flexion	End range active extension	90° squat
20% cut-off	52.50	48.72	53.58	55.03
50% cut-off	75.79	64.06	80.63	66.79
100% cut-off	100	X	100	100

Off 100% cut-off no patient had pain in end range active flexion, therefore there's no percentage of pain reduction

Non-prespecified findings

- 3 patients reported pain recurrence after 3 weeks.
- All patient's respondent or not to MFR reported tenderness over the DFL, especially tibialis posterior, pes anserinus, adductors, intermuscular septa and iliacus.
- Quicker recurrence of pain was observed with higher body mass index (BMI), lower muscle strength and associated gait deviations as waddling and pelvic drop.

One patient with a history of abdominal trauma, hernia and mesh repair had a pain reduction of 56% post MFR; reported continuous reduction of pain over the following days until pain reached 0/10 NPRS.

Discussion

The percentage of pts with pain reduction of 50% and 20% was 47.54% and 80.33% respectively. Knee OA is reported at North Africa and Middle East as 4610 per 100,000, for cut-off values of 50% and 20% an estimation of 2191.6 and 3703.1 per 100,000 pts suffer pain originating from DFL myofascial dysfunction. The presented prevalences cannot be considered as asymptomatic OA, Pain reduction identifies myofascial pain but doesn't negate presence of symptomatic OA. The 100% pain reduction group is identified as asymptomatic OA, as pain completely vanished after MFR, demonstrating no degenerative articular element of pts' pain. Asymptomatic OA is identified in 13.11% of the sample, estimated to 604.6 per 100,000 pts. In this group of patients, knee pain is only myofascial and Knee OA is misdiagnosed as a source of pain.

KAS was initially reported as a restriction of the abdominal fascia through complicated surgical cesarean section incision [14], patient of the reported case had 100% pain reduction after one session of MFR and no recurrence at 1.5 years follow-up. Authors of this study set two parameters for diagnosis of KAS, pain reduction of 100% and no pain recurrence for 1 week, expecting it as a permanent reduction.

Based on results of this study; the two parameters for KAS diagnosis, percentage of pain reduction & duration of reduction maintenance can be modified. Pain reduction can be less than 100%, as one patient reported 56% pain reduction, & continuous reduction over the course of the following days without further treatment. Pain reduction maintenance is evaluated over long term follow up, as 3 pts reported pain recurrence after 3 weeks, proving 1 week is not a permanent outcome. For patients who had partial pain reduction or experienced pain recurrence after 1-week, repeated myofascial MFR sessions should be cared out to determine wither or not pain can be accumulatively reduced, and if it can be reduced permanently. The two parameters should be further investigated for the development of proper diagnostic criteria.

The forementioned findings guide toward modification of the concept of KMPS and KAS to knee myofascial pain spectrum (KMPs) (Figure 1). On the left side pts have MS weakness feeding the myofascial dysfunction, as weakness of hip abductors will cause a reduction of reciprocal inhibition of the adductors causing its myofascial component tightness termed as (tightness inhibition relation) [20], on the right side pure myofascial restriction with no MS weakness; pure passive restriction. Treatment on the left side should include MFR, stretching and mobility to the myofascial restriction and MS strengthening exercises for MS imbalance. On the extreme right, patients should have myofascial directed treatment with no need for MS strengthening exercises.

Figure 1. Knee myofascial pain spectrum

Association of myofascial dysfunction in knee OA patients has been reported [21, 22], even though causation or coexistence could not be determined [23]. In the current study, we explore myofascial causation of knee pain as a separate entity from articular degeneration (OA), as pain originates from knee's capsule by tension induced by the deep front-line dysfunction (DFLD). In this study's population, 80% had pain reduction to MFR, of the 80% 13% had 100% pain reduction, while 20% had no pain reduction to MFR. Knee OA is an articular originated pain. Achieving 100% pain

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reduction with no change to the articular status is indicative of asymptomatic OA (Figure 2 Left). The 20% of pts with no pain reduction have symptomatic OA, demonstrating a dissociation between DFLD and symptomatic knee OA (Figure 2 right). Of 67% with pain reduction less than 100%; coexistence of DFLD and symptomatic OA could be present (Figure 2 center). Symptomatic OA cannot be proven existent in pts responding to MFR until full treatment to both active and passive components of KMPs has been cared out and pain free status has not been achieved. Intraarticular injection of anesthetic is doubted to differentiate symptomatic knee OA and KMPs; as the anesthetic is enclosed in the joint capsule and will affect it as it will the articular surface.

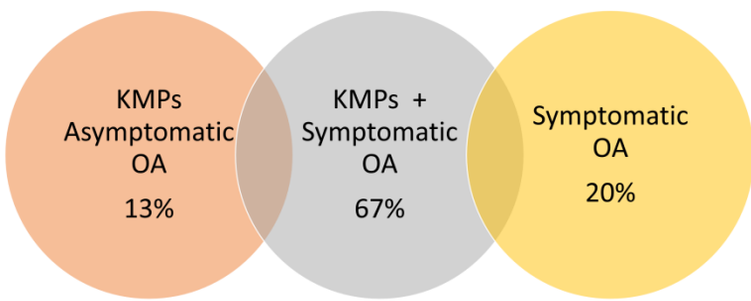

Fig. 2. Patients' diagnoses and pain causes

Patients with higher pain reduction had less pain in non-weight bearing positions as active knee flexion and extension, and more in standing, with 100% of the sample had pain in squatting across the 3 cut-off values (Tables 3 and 4). Patients with pain focused on high load weight-bearing activities are predicted to have a higher pain reduction percentage. Even though pain across all positions can be responsive to MFR but with less pain reduction. Percentage of pain reduction doesn't differ substantially across the 4 different positions across all cut-off values (Table 3).

Conclusion

KMPs is a newly proposed term, describes a spectrum of active and passive dysfunctions related to knee capsule; KAS and KMPS. 100% pain reduction identified asymptomatic OA, misdiagnosed as source of pain in 13 of pts. 67% of knee OA pts have KMPs with OA not identified either symptomatic or asymptomatic. Implementation of strengthening exercise (Active element) with MFR (passive element) as a long-term treatment is essential to differentiate status of knee OA. Pain reduction of 100% of one session of MFR is not enough to diagnose KAS. Long term follow up and repeated MFR is needed for verification of the diagnosis. We report a promising pain reduction of the majority of the pts more than 20%, that should be investigated in full treatment and long term studies.

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