

# Pericapsular soft tissue as a pain generator in hip osteoarthritis: considerations for developing a new home exercise to prevent surgery

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In previous studies by Fernandes et al. [1] and Svege et al. [2], the inclusion criteria of exercise as a non-surgical treatment for osteoarthritis (OA) of the hip included a Harris Hip Score (HHS) between 60 and 95 points, and total hip arthroplasty (THA) was indicated for patients with an HHS below 60 points. A number of studies have examined participants with mild to moderate OA of the hip [1-5]. In a randomized clinical trial, Bennell et al. [6] implemented a multimodal physical program for patients with OA of the hip [6]. Their results revealed that the physical therapy program conferred no additional clinical benefit over a realistic sham condition for 51% of patients with moderate to severe OA of the hip, and it was reported that the program was associated with relatively frequent but mild adverse effects [6,7]. Most studies of exercise interventions for OA have examined muscle strength training, stretching, functional training, and aerobic fitness programs [8]. However, functioning of patients with moderate to severe OA of the hip has not been reported to improve using these exercise methods alone.

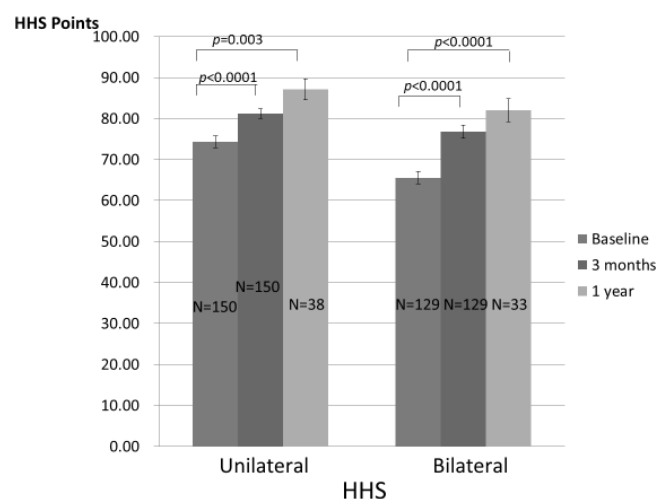
However, many patients with an HHS below 60 points wish to postpone surgery for a range of reasons, including work, child-rearing, or caring for parents, when seen on an outpatient basis. We have found that many patients with OA of the hip complained of hip pain at standing and at first step when starting to walk but decreased hip pain during walking. Many patients experience motion pain with no walking pain or mild walking pain. This phenomenon has been observed even in patients with an HHS below 60 points. We speculate that motion pain can be caused by contracture of the hip joint, whereas walking pain can be caused by contact of the subchondral bone after the cartilage has disappeared from the joint surface. This suggests that motion pain could be decreased by exercise, whereas walking pain may be decreased by surgery. An anterior pelvic tilt and elevation of the greater trochanter of patients with OA of the hip can cause apparent shortening of leg length on the affected side. This apparent difference in leg length can result in instability while walking. We considered that this instability may cause repetitive pericapsular soft tissue (joint capsule, ligaments, inner muscles) injury, resulting in contracture of the affected hip. Thus, correction of pelvic malalignment before a strengthening exercise is necessary in addition to decontracture exercise of the affected hip to decrease motion pain. Decontracture may provide a useful method to ease joint stiffness.

We developed a decontracture and pelvic realignment exercise technique called the pericapsular soft tissue and realignment of the

pelvis (PSTR) exercise [9]. In a retrospective study, PSTR exercise induced significant improvement in patients with OA of the hip (Table 1 and Figure 1) [9]. In addition, PSTR exercise resulted in a significant improvement even in patients with an HHS below 60 points (Figures 2 and 3) [10]. We have begun a multicenter prospective single-arm study to confirm the effects of PSTR exercise [11]. We plan to investigate the decontracture test to differentiate between motion pain and walking pain to determine surgical indications in future studies.

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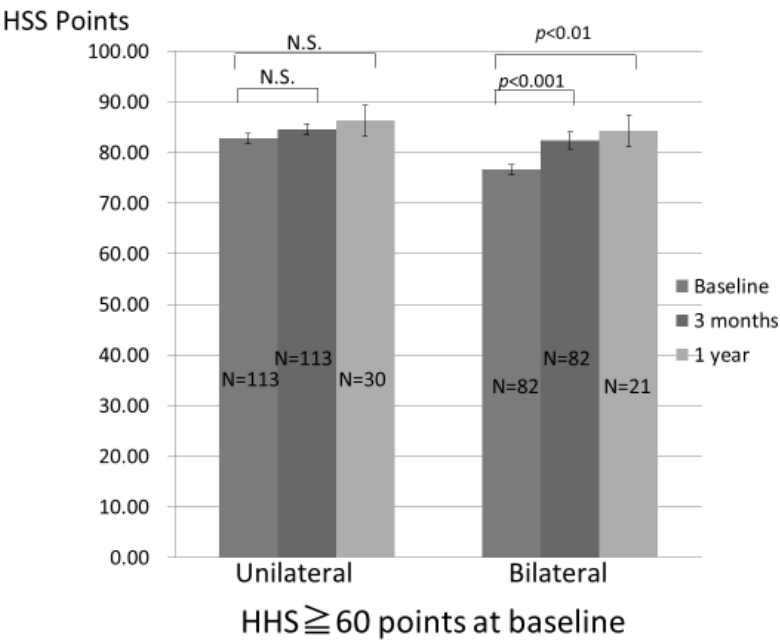
**Figure 1.** HHS change after PSTR exercise in patients with an HHS above 60 and below 59 points at baseline

Unilateral: Group with unilateral OA of the hip (no pain in the opposite hip)

Bilateral: Group with bilateral OA of the hip (pain in the opposite hip)

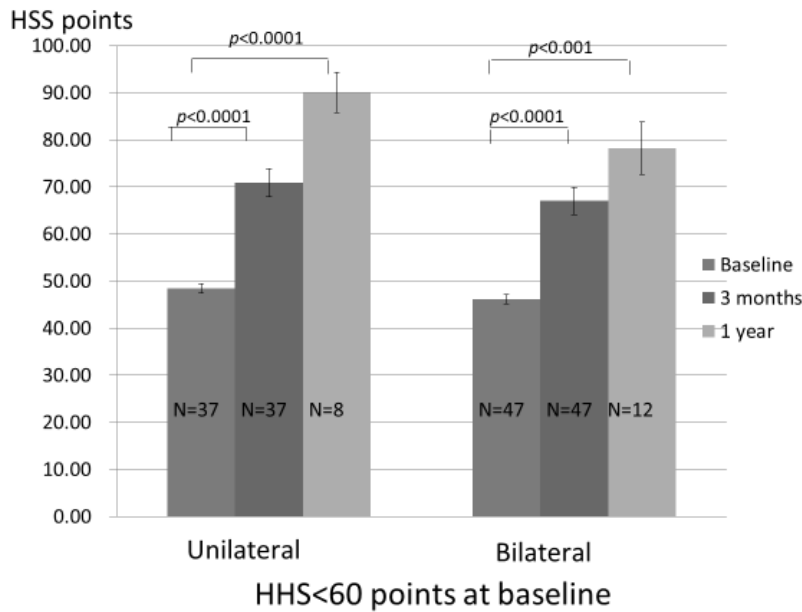
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**Figure 2.** HHS change after PSTR exercise in patients with an HHS above 60 points at baseline

Unilateral: Group with unilateral OA of the hip (no pain in the opposite hip)  
Bilateral: Group with bilateral OA of the hip (pain in the opposite hip)



**Figure 3.** HHS change after PSTR exercise in patients with an HHS below 59 points at baseline

Unilateral: Group with unilateral OA of the hip (no pain in the opposite hip)  
Bilateral: Group with bilateral OA of the hip (pain in the opposite hip)

**Table 1.** Baseline characteristics

Mean ± S.D.	Unilateral Group(n=154)	Bilateral Group(n=131)
Age (years)	56.4 ± 14.2	54.2 ± 12.8
Women, no.(%)	133 (86.4%)	123 (93.9%)
BMI (kg/m²)	22.0 ± 3.3	22.1 ± 3.2
HHS (0-100)	74.14 ± 17.79	65.35 ± 17.24
No. (%) below 59	n=38 (25.0%)	n=49(37.4 %)
No. (%) above 60	n=114 (75.0%)	n= 82 (62.6%)
Duration of pain (months)	30.8 ± 50.4	55.7 ± 98.7

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