



EFFECT OF THE COPENHAGEN PROTOCOL AND HOLMICH PROTOCOL FOR CHRONIC GROIN PAIN IN YOUNG ADULT FOOTBALL PLAYERS FOR IMPROVEMENT IN PAIN, STRENGTH AND PERFORMANCE - A COMPARATIVE STUDY.

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ABSTRACT

Background: Groin injuries often exhibit major problems, such as high rates of recurrence [3], prolonged durations of absence from sports [1], unclear prognosis [4], and its chronicity [4, 5]. This causes time loss and some of the biggest losses in the performances of the players. Thus it has been a challenge for physiotherapists as well as players who suffer from the injury. Only some advances in the exercise therapy has successfully reduced the time loss and provided significant improvement in the performances later on. Studies done by Holmich et al. and Haroy et al. have provided impressive results in treatment of the players suffering from chronic groin pain and overall reduction of adductor related groin injuries. Testing of this exercise therapy protocols on the parameters of the pain reduction, strength and performance improvement and comparing the results amongst each other is yet to be done on the quantitative and qualitative analysis. **Aim:** To study and compare the effects of the Holmich protocol and Copenhagen protocol in pain reduction strength improvement and performance improvement among young adult footballers with chronic groin pain. **Method:** 61 footballers with the chronic groin pain complaints were selected as study subjects. Total sample size was then divided into two groups by odd and even method to form two intervention groups for both the protocols (Group A and Group B). Prevalence was tested on the basis of VAS MMT and Hip and Groin Outcome Scale (HAGOS). These intervention groups performed adductor strengthening protocols during their warm up sessions or as a treatment when the players were unable to play for their respective teams. **Results:** In our studies we have compared the results of the pre interventional findings with post interventional results in two groups of football players (Group A and Group B). The data was then analyzed for inter-group and intra-group analysis and comparison was done statistically. The results from the studies showed

- 1) Copenhagen protocol was significantly better in terms of the reducing the pain in subjects.
- 2) Holmich protocol was significantly better in terms of improvement of the strength in subjects.
- 3) Copenhagen protocol was significantly better in improvement of the performance of the subjects.

Conclusion: Both the adductor strengthening protocols have shown significant improvement in terms of treating the subjects but on the basis of pain reduction and performance improvement Copenhagen protocol showed better success rates. Whereas Holmich protocol has excelled in terms of strength improvement amongst the subjects.

KEYWORDS : Groin pain, Football players, Adductor related groin pain, Holmich protocol, Copenhagen protocol.

INTRODUCTION:

Groin pain is very common and widespread in the sports, specifically with the sports associated with the kicking and the turning movements such as football. ^[1] Groin injury was a frequent occurrence in men's and women's senior football, comprising about 7 to 13% of all time-loss injuries. Groin injury was more frequent in men's football, with a more than two-fold higher rate identified in male compared with female players. ^[2]

Injured footballers may be forced to wait a long time before returning to sports activity without any restriction. The injury rate is 1.015–1.133 per 1000 hours of play, which is equivalent to near total of 11%–16% of all football injuries. ^[2] ^[3] In football, the groin injury is frequently adductor related and the 2 out of the 3 recorded cases are adductor related groin pain. Adductor-related groin pain is often treated without surgery. Among different conservative approaches, it appears therapy (ET) is more effective than other conservative treatment methods such as electrotherapy, manual therapy or steroid injections. In recent studies conducted by Haroy et al showed significant improvement in the said time loss injury associated with groin pain with the single exercise with different level of the progression of the strengthening. Whereas study conducted by Homich et al also showed the near 50 % of the improvement in the athletes with the primary focus being on the isometric strengthening of the adductors of the hip.

In the current study we reproduced the Holmich et al's research to treat adductor related groin pain injuries from sport and sports related activity and compared its findings with the Copenhagen protocol developed under the research of Haroy et al.

MATERIALS AND METHODS:

Various football clubs and football teams were approached and players were reached by the announcements and through digital mediums. Total of 88 players across the city applied for the interview and primary examination, of these players total 70 players were included in the study and given the informed consent for further inclusion in the study.

Inclusion Criteria:

Male aged between 16-30 years.

Complaints of groin pain for at least 2 months.

Pain at palpation of the adductor tendons or the insertion of the pubic

bone or both and groin pain during adduction against resistance had to be in range of 0-6, based on the visual analogue scale (VAS)(with squeeze test).

In addition, at least two of the following criteria had to be present:

- A clear history of groin pain and stiffness in the morning,
- Cough-induced or sneeze-induced groin pain,
- Nocturnal groin pain.

Exclusion Criteria:

- Any evidence for the groin pain related to the hernia and sports related hernia.
- Any evidence reported for the stress fracture and the palpatory pain in the corresponding anatomical site.
- SI joint dysfunction.
- Hip arthrosis and any sclerotic or cystic narrowing at the hip joint.
- Any relevant surgical conditions. Inclusion and exclusion criteria are as described in the table above.

Baseline Questionnaire:

After inclusion and formal consent the subjects were given the Hip and Groin Outcome scale at the baseline to begin the further studies and to develop proper pre and post results.

Design:

The study was designed to compare the effects of the Copenhagen Protocol and Holmich protocol in terms of improvement in pain, strength and performance of the players. Thus subjects were divided into two separate groups using odd and even method for grouping (Group A and Group B). Group A received Copenhagen Protocol and Group B received Holmich protocol.

Group-A (Copenhagen Strengthening Protocol):

The Adductor Strengthening Programme consisted of a single exercise with multiple levels of difficulty.

The exercise was based on the Copenhagen Adduction (CA) as this has previously been shown to be a high-intensity exercise targeting the adductors. As the CA might be painful or difficult to perform for symptomatic players, we created two easier levels that players could choose from: level 1 (easiest): side-lying hip adduction; level 2 (moderate): the CA as previously described, but with a shorter lever

arm; and level 3 (hardest): the CA as previously described (figure 1).

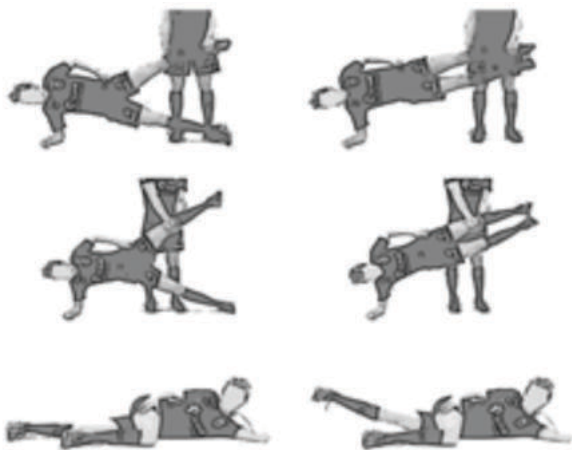
Videos with detailed information on the performance of each level are available as an online supplementary appendix.

Players were asked to start at level 3. However, if they experienced groin pain during the exercise >3 on an 11-point numeric rating scale (0–10, where 0 is no pain and 10 is maximal pain), they were instructed to perform level 2 instead.

Similarly, if level 2 provoked pain >3/10, the player was informed to perform level 1. The exercise was performed on both sides. Teams in the intervention group were asked to perform the programme as a part of their regular warm-up, 2–3 times a week for a minimum of 8 weeks during the practice sessions and maintain the programme once a week. At a team visit during practice sessions, players and coaches in the intervention group were shown how to perform the different levels of the programme by the principal therapist.

Team medical staffs were also included in the instruction session whenever possible. We encouraged the players, coaches and medical staff to contact us if they experienced problems or any other adverse events when performing the exercise.

The protocol to be followed and encouraged to be progressed to the level 3 for improvement and better recovery from level 1 to level 2 and from level 2 to level 3.



Holmich Protocol:

Module 1 (first 2 weeks)

- 1 Static adduction against soccer ball placed between feet when lying supine; each adduction 30 s, ten repetitions.
- 2 Static adduction against soccer ball placed between knees when lying supine; each adduction 30s, ten repetitions.
- 3 Abdominal sit-ups both in straightforward direction and in oblique direction; five series of ten repetitions.
- 4 Combined abdominal sit-up and hip flexion, starting from supine position and with soccer ball placed between knees (folding knife exercise); five series of ten repetitions.
- 5 Balance training on wobble board for 5 min.
- 6 One-foot exercises on sliding board, with parallel feet as well as with 90° angle between feet; five sets of 1 min continuous work with each leg, and in both positions.

Module II (from third week; module II was done twice at each training session)

- 1 Leg abduction and adduction exercises lying on side; five series of ten repetitions of each exercise.
- 2 Low-back extension exercises prone over end of couch; five series of ten repetitions.
- 3 One-leg weight-pulling abduction/adduction standing; five series of ten repetitions for each leg.
- 4 Abdominal sit-ups both in straightforward direction and in oblique direction; five series of ten repetitions.
- 5 One-leg coordination exercise flexing and extending knee and swinging arms in same rhythm (cross country skiing on one leg); five series of ten repetitions for each leg.
- 7 Balance training on wobble board for 5 min.

8 Skating movements on sliding board; five times 1 min continuous work.

The treatment was administered for alternate days in every week thrice a week at maximum. Both intervention groups got the exercise therapy sessions at the clubs or at domestic environments. During the time of the intervention players were asked not to participate in their games and avoid stretching of the adductor group of muscles. Meanwhile other muscle group stretching was done properly and regularly to maintain the flexibility. During the time of intervention sprinting and twisting turning movements are to be avoided and brisk walking and jogging at limited pace is promoted over other aerobic activities.

Both the protocols are limited for 8 weeks of the duration but participants were allowed to continue the treatment till 10 weeks if needed in both intervention groups. All the participants were asked to return to the sports activities on 15th week if not earlier and were asked to return on 20th week for the final follow-up where proper post treatment data was collected in terms of VAS MMT and HAGOS scoring.

Outcome Measures

A) Subjective analysis
· HAGOS scale

B) Objective analysis.

I. Pain assessment

VAS (visual analog scale) is used as an outcome measure for the pain

- 1) VAS on squeeze test (pain scaling with resisted adduction of hip).
- 2) VAS on rest.

II. Strength assessment.

Squeeze test.

III. Performance assessment.

The functional assessment tests

- 1) Agility t-test.
- 2) Triple hop test.

Statistical Analysis

Paired t test the intra group analysis was done and with unpaired t test comparison of the results in between the two intervention groups is done. Software used for such analysis was GraphPad Prism.

RESULTS:

Out of total 70 initial subjects 6 dropped off the study as it wasn't convenient for them to maintain regular follow ups due to work and other personal reasons. 3 subjects dropped off from the further studies as they felt the pain worsening after the treatment. Thus grouping was done on odd and even selection method for equal distribution of the athletes for both the intervention groups Group A(Copenhagen protocol) Group B(Holmich protocol).

Baseline Characteristics:

n= 60 (total sample size.)

nA(copenhagen protocol)= 31 .

nB(Holmich protocol)= 30.

Table- 1

	Group A	Group B
Age	22.80(SD= 2.43)	22.60(SD=3.01)
Height	1.69m (SD= 0.73)	1.72m(SD=0.8)
Preferred limb	25 right 6 left	28 right 2 left
Location of injury	28 right 3 left	29 right 1 left
Pain (VAS)	7.5(SD= 1.03)	8.06±1.8
Strength (squeeze test)	203.8(SD= 6.67)	202.3(SD=7.04)
HAGOS score	228.9 (SD=24.57)	222.63(SD=19.44)

VAS= visual analog scale (No pain=0, Maximum pain=10)

After the baseline evaluation and regular weekly follow-ups done for both the interventional groups for 20 weeks. We have observed that both interventions helped with recovery in all three key parameters of this study. On the final follow up of the subjects on 20th week we asked them about return to the sport and found out Group A subjects returned the sports in 13.5 weeks on an average whereas in Group B population returning to the sports was done on 14.2 weeks. From the total study population of 60 we found out 5 players still had symptoms of groin

pain but all of them reported improvement on VAS squeeze test and HAGOS score along with two performance test parameters of the study (triple hop test, t-test).

Measurements were made on the beginning of the treatment on first week after equal distribution of the subjects into two interventional groups and then on 10th week at the end of the treatment for both groups study population. For the key parameters of the interventions and study the results are as below.

The subjective analysis was done on the basis of the Hagos scale with all its components whereas objective analysis of the study was done on the basis of VAS for pain, Squeeze test for strength development, and Agility T-test and Triple hop test for improvement in performance in terms of agility and dynamic stability amongst the athletes.

Pain

We quantified the results for pain on VAS scale as an outcome measure and found out

Copenhagen protocol proved to be better in terms of the pain reduction.

Table 2

VAS with squeeze test	Pre intervention	Post intervention
Group A	7.4±1.2	2.83±0.7
Group B	7.1±0.7	1.63±0.8
VAS on rest	Pre intervention	Post intervention
Group A	4.8	1.27
Group B	5.23	0.97

Strength

We studied the results of strength on the basis of squeeze test and identified the effectiveness of the Holmich protocol in significant improvement in the strength.

Table 3

Strength (Squeeze test)	Pre intervention	Post intervention
Group A	203.8±6.67	229.3±10.47
Group B	202.3±7.04	238.8±9.99

Performance

T test and triple hop test to identify the improvement in the performance of the subjects in both interventional groups. Copenhagen protocol proved out to yield better results in improvement of overall performance in group A.

Table 4

Dependable Variables	Pre	Post
GROUP A HAGOS scoring	240 + 28.965	498.47+ (13.60)
GROUP B HAGOS scoring	226.56 +18.174	460.38 + (12.99)
Agility T test A	12.2 + (0.87)	9.63 + (0.78)
Agility T test B	12.5 6+ (2.6)	10.86 + (1.89)
Triple hop test A	4.22+ (0.67)	5.76 + (0.69)
Triple hop test b	4.37+ (0.23)	5.42+ (0.45)

DISCUSSION:

In this study we evaluated the results of the two ET protocols to establish their effectiveness in treatment of the Pain and in improvement of the Strength and Performances of the subjects participated in the study. Our findings show that both of this exercise protocols are significantly effective for giving proper recovery in terms of the all three key parameters of this study (pain, strength and performance). Whereas when we compared the results of the both protocols we observed that among the athletes.

We found that both ET protocols yielded great results while reducing the symptoms of the groin pain while on rest as well as while functioning and playing the sports. But comparison of the data suggested Copenhagen protocol yielded better results in terms of reducing pain over Holmich protocol from the baseline.

In assessment of the strength we found out improvement in strength of both the study groups but on the contrary to other parameters of this study the strength improvement is seen to be better in the athletes undergoing the Holmich exercise therapy protocol over the athletes from the study group of Copenhagen protocol from their baseline initial results.

The comparative study in between both the groups showed that

Copenhagen protocol was better in terms of improving the overall performance of the athletes compared to Holmich protocol.

Athletes from group A returned the sports on 12th week on an average whereas athletes from group B returned the sports on 14th week. Thus Copenhagen protocol proved to be better for improved functioning ability and thus can be considered as a good an exercise therapy program to reduce the time loss factor involved with the groin pain.

CONCLUSION:

Copenhagen protocol proved out to be better treatment method available when it came to the parameters such as strength and performance improvement of the athletes but holmich protocol proved to be the better treatment when we considered reduction in pain of the players. However future studies or development of new treatment protocol should put more emphasis on hip adductor strengthening in both intrinsic as well as extrinsic manners.

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