



GROIN & HIPS

The
Latest
International
Evidence
April 2012

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GROIN & HIPS

The Latest International Evidence

“The Bermuda Triangle of Sports Medicine...”

BEZZINI, BJSM 2011

An overview compiled by **Helen Millson** of IPRS
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Thanks to: **Dr Zafar Iqbal** (Liverpool FC) who gave excellent overviews on an on-going basis; **Mr James Moore** (Consultant Physiotherapist) for his respected contribution; all the National and International Specialists for their valuable input (highlighted throughout the handbook).



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GROIN PAIN

INTRODUCTION

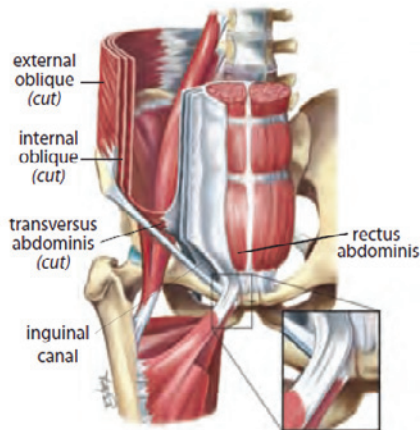
Groin pain is one of the least understood and explained symptoms in sports medicine. There is little consensus on diagnosis, pathophysiology, investigation or management and has not been subjected to well designed scientific trials.

- **Lack of specific clinical tests**
- **Co-existence of multiple pathologies**
- **Pain is not a good localiser of pathology**
- **Lack of agreement of diagnostic criteria**

The purpose of the handbook is to find consensus regarding Groin Pathogenesis, Differential Diagnosis, Conservative Treatment, Surgical Treatment and Post Surgical rehabilitation.

GROIN PAIN

ANATOMY



Anatomy of the hip and groin area

Bruckner & Kahn Clinical Sports Medicine,
Fourth Edition 2012



Dr William Meyer 2011:

Careful anatomic dissections and biomechanical studies in fresh cadavers reveal a concept of two joints in the pelvis – the ‘ball-in-socket’ hip joint and the ‘pubic joint’, in which the entire pubic symphysis is at the centre of many movements.

Six anatomic concepts essential to know for the care of patients:

- The ‘pubic joint’ (as opposed to the ‘pubic symphyseal’ joint)
- The aponeurotic plate (the fibrocartilage that surrounds both pubic symphyses)
- The centrally attaching muscles and soft tissues, e.g. rectus abdominis, pectineus, adductor longus and adductor brevis, versus the peripheral supportive muscles, e.g. rectus femoris, iliacus, psoas, sartorius

- Identification of core-destabilizing versus non-destabilizing injuries with respect to surgical versus non-surgical treatments
- The role of anatomy and other factors in choosing between temporizing versus more definitive surgical procedures

The proximal anatomy of AL, AB and Gracilis is more complex than previously described. The arrangement and fusion of these muscles, their fibrocartilaginous entheses and differences in vascularity of their proximal tendons may be important anatomical considerations in the pathogenesis and pattern of adductor-related groin pain. (Davis et al BJSM 2011)

GROIN PAIN

ANATOMY

Pearls from various studies:

- Anatomically fibres of the Inguinal ligament merge with fibres of the Adductor muscles of the thigh.

(David Lloyd 2006).

- Ilio Psoas blends with the hip capsule leading to hip symptoms and joint effusion. (Connell 2009)

- Hip adductor muscles (particularly Add Longus and Pectineus) are important pelvic stabilizers during single leg stance. (Meyer 2011)

- Inter-relationships between the hip and the pubic joint. (Meyer 2011)

- Dynamic hip motion control in sports, such as soccer, requires synergistic abdominal and hip region co-activation to maintain appropriate lumbo-pelvic alignment.

- Functional instability = weakness, poor endurance, reduced extensibility, or poor co-ordination of these muscular synergists. Also overuse and injury at comparatively weaker non-contractile structures.

Anatomy vs Functional Anatomy

The diagnostic challenge is relating the anatomical structural pathology to pain mechanism and function

DIFFERENTIAL DIAGNOSIS



Dr Zafar Iqbal, Doctor, Liverpool Football Club 2012:

- The diagnosis should be made by exclusion



Dr Andy Franklyn-Miller 2011:

- The diagnosis cannot be made without a high level of understanding of the anatomy
- A thorough examination of the groin is essential, not just a referral for MRI!
- The examination in high level players must include 3D Biomechanical Motion Capture



Dr John F.W Garvey 2011:

- The physical signs are subtle in isolation, but when combined a consistent pattern of injury emerges
- Diagnostic imaging must be

performed by an independent radiologist who has the time, desire, equipment and skills to detect minute abnormalities using several imaging techniques including plain radiology, ultrasound, MRI and SPECT/CT



Dr William Meyers 2011:

- The term 'sports(man's) hernia' is a misnomer.
- These injuries are a whole set of musculoskeletal injuries that occur to muscles, other soft tissues and bones of the pelvic area
- Hence, we refer to these injuries under the umbrella title "athletic pubalgia"
- We have described at least 19 distinct athletic pubalgia syndromes, involving distinct injuries to different parts of this anatomy

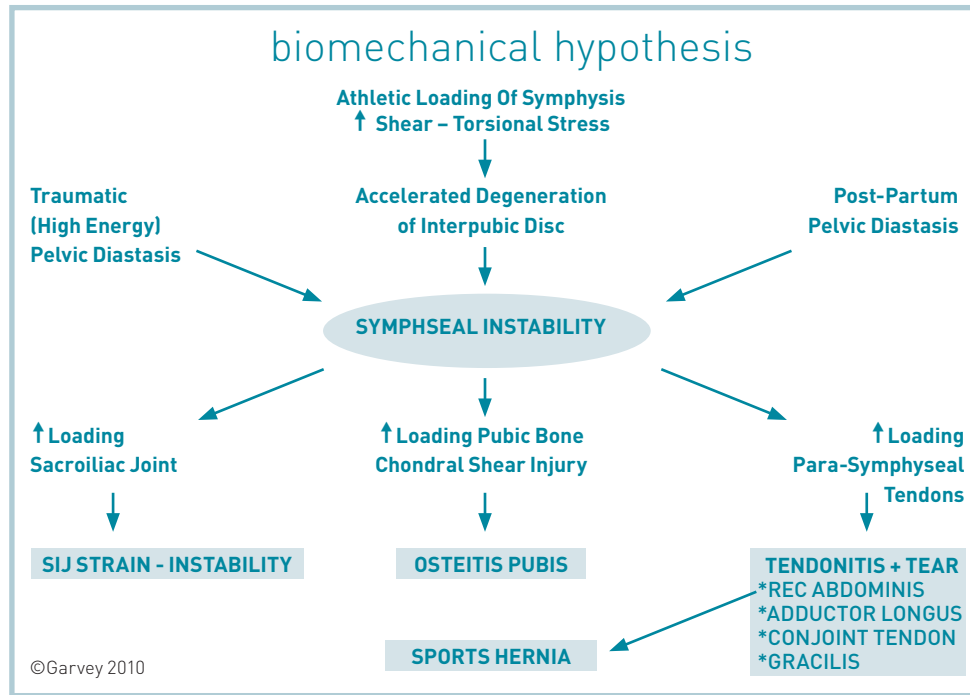
Because there can often be multiple pathologies or signs, then it is important to look at all, rather than go for first pathology seen and therefore create iatrogenic damage by surgery for a pathology which may not be causing the problem.

! Importance of imaging at signing or when asymptomatic, as it can highlight pathologies/signs that were always there before symptoms started.

For example posterior wall defects don't all cause groin pain, whereas if you have groin pain and see a hernia surgeon who, using USS, shows a posterior wall defect then they will operate even if the person had a posterior wall defect prior to symptoms starting. Alternatively, not all pubic symphysis secondary clefts cause pain and may be longstanding.

GROIN PAIN

DIFFERENTIAL DIAGNOSIS



Garvey et al, (Hernia 2010)

This gives a basis of biomechanical overload for groins which showed that the pubic joint is the central key and the abdominal problem is secondary, or as a consequence, of the pubic joint injury.

GROIN PAIN

DIFFERENTIAL DIAGNOSIS

Many studies contributed to the tables below

Traumatic Causes
Subluxation or dislocation
Fracture or stress fracture
Haematoma
Contusion

Joint
Hip
T12 – L1
Sacroiliac

Hernia-related
Femoral
Inguinal – Direct/Indirect
Inguinal canal weakness
Inguinal ligament dysfunction
Gilmore’s/Sportsman’s Groin
Other structural wall defects/ conjoint tendon dehiscence

Musculo tendinous / orthopaedic
Adductor tendinopathy / enthesopathy / dysfunction / Adductor muscle strains / Insertional tendinosis
Ilio Psoas tendonosis / strain / bursitis
Psoas dysfunction
Rectus Abdominus – tendonosis / distal strain / avulsion
Abductor tears (rotator cuff tears of the hip)
Psoas impingement
Rectus femoris strain / avulsion
Gracilis strain
Sartorius strain
Piriformis syndrome
Conjoint tendon strain / avulsion
Myositis of the hip muscles
Myositis ossificans
Snapping hip syndrome
Tendinopathy of Inguinal ligaments

Osseus
“Osteitis Pubis” / “Pubalgia”
Pubic instability
Stress fractures – Pelvic, Femoral neck, Sacrum, Ischium, Pubic bone stress reaction, Pubic ramus
Pubic disc degeneration
Pubic symphysisitis
Pubic instability
Avulsion fracture – lesser trochanter / ASIS / AIIIS
Osteoarthritis
Avascular necrosis
Osteoporosis
Spondyloarthropathies

Nerve entrapment
Ilio Inguinal nerve
Obturator nerve
Lumbar radiculopathy

GROIN PAIN

DIFFERENTIAL DIAGNOSIS

Non-musculoskeletal causes
Hernia
Psoas Muscle abscess
Endometriosis
Peripheral Vascular Disease
Appendicitis
Diverticulosis
Adhesions
Irritable bowel syndrome
Intra-abdominal abnormality
Unknown Etiology
Transient osteoporosis of the hip
Bone Marrow oedema syndrome

Infectious/Tumorous/Metabolic
Septic Arthritis
Osteomyelitis
Benign neoplasms of bone/soft tissue
Malignant neoplasms of bone/soft tissue
Metastatic disease of bone

Genito-Urinary & Gynaecologic
Urinary tract infection
Prostatitis
Testicular pain
Varicoceles
Epididymitis
Salpingitis
Genital inflammation
Hydrocele
Lymphadenopathy
Neoplasm
Renal Lithiasis
Pelvic inflammatory disease
Ovarian cyst
Ectopic pregnancy
Menstrual pain/ Endometriosis
Round ligament entrapment

Inflammatory conditions
Rheumatoid Arthritis
Reiter Syndrome
Psoriatic Arthritis

Synovial Proliferative disorders
Pigmented villonodular synovitis
Synovial chondromatosis
Chondrocalcinosis

Metabolic causes
Paget disease
Primary hyperparathyroidism

GROIN PAIN

DIFFERENTIAL DIAGNOSIS

HIP: Intra articular hip pathology
Labral Pathology
Ilio Femoral Ligament tear
Femoro-acetabular impingement
Chondral lesions
Loose bodies
Stress fractures of femoral head or neck
Structural abnormalities of femoral neck
Capsular laxity
Ligamentum Teres rupture
Acetabular labrum lesion
Acetabular dysplasia
Slipped capital femoral epiphysis
Osteoarthritis of the femoral head
Avascular necrosis of the femoral head
Hip degenerative joint disease
Congenital dysplasia
Osteoporosis
Myositis ossificans
Perthes disease

HIP: Extra articular hip pathology
Hypermobility
Trauma
Dysplasia
IP Tendinosis / Impingement
ITB
Gluteus Medius / Minimus
Trochanteris bursa
Stress fracture
Adductor strain
Iliac crest avulsion
Ischial bursitis
Coxa saltans (internal or external)
Athletic pubalgia
Piriformis syndrome

HIP: Chondral Pathology
Lateral Impaction
Osteonecrosis
Loose Bodies
Chondral Shear Injury
Osteoarthritis

HIP: Capsule Pathology
Laxity
Adhesive Capsulitis
Synovitis or inflammation

GROIN PAIN

DIFFERENTIAL DIAGNOSIS

For an excellent overview:

**Chris Bradshaw and Per Holmlich -
Brukner and Khan Clinical Sports
Medicine, 2012**

(p548-549 tabulates most succinctly)

Causes of longstanding groin pain:

Common / Less Common / Not to be
missed

**Four clinical entities that may be
involved in longstanding groin pain:**

Clinical entity / Adductor related /
IP related / Abdominal wall related /
Pubic bone stress related

Recommended reading:

Meyers et al, Elsevier 2005

Anatomic basis for evaluation of
abdominal groin pain in athletes

Pers Holmich BJSM 2007

Longstanding groin pain in sports
people falls into 3 primary patterns:
A clinical entity approach

**Falvey, Franklyn-Miller, McCrory
BJSM 2009**

The Groin Triangle: A Patho-
Anatomical approach to the Diagnosis
of Chronic Groin Pain in Athletes

Gabbe et al, Br J Sports Med 2010

tabulates the most common diagnoses
of hip and groin injuries sustained by
the cohort in the AFL

Anthony Hogan (Australia) has very
good diagnostic categories

DIFFERENTIAL DIAGNOSIS

Summary

- Multifactorial and can have multi pathologies
- There is no parameter in isolation – need sound clinical judgement for overall picture
- Key is understanding of anatomy and likely pain generator
- History, examination and investigations geared towards excluding the common pathologies
- Blood tests to exclude inflammatory and infective causes
- Refer to surgeon only if happy that one has the likely cause of the pathology and thus wanting confirmation and specialist follow-up

TAKE HOME MESSAGE

1. Rule out any hip pathology
2. Highlight Adductor / Pubic joint related structures relative to pain
3. Highlight Abdominal related structures relative to pain
4. Highlight the neurophysiology of the pain mechanism
5. Once Hip pain has been ruled out, one needs to think about groin pain as primarily a pubic joint injury, with sub-categories of other associated pathology – sportsman's groin, adductor tendinopathy, bone stress injury, neuropathy etc.

(James Moore,2011)

GROIN PAIN

RADIOLOGICAL IMAGING



Dr Otto Chan 2011:

- Plain film and US – if US is abnormal and confirms hernia, refer for surgery!
- Plain XR and US normal – MRI to look for labral tear, muscle tears, osteitis pubis, bone or soft tissue tumours etc.
- MRI normal and persistent “hip pain” – repeat MRI as an MRA with diagnostic injection of hip at the same time. The reason for not doing an MRA and an injection straightaway is that it is invasive and if the MRI shows the problem without an intra-articular injection, you have saved the patient an invasive procedure.



Dr Richard De Villiers 2012:

- X-ray of the pelvis is essential to look for signs of osteitis pubis, early FAI, enthesopathy or other gross pathology
- MRI and US are the next imaging steps and are complimentary examinations
- Ultrasound is used primarily to assess for occult hernia, erosions of osteitis pubis and for advanced adductor tendinopathy
- MRI optimally shows bone oedema of osteitis pubis/ stress fracture, symphysis pubis and adductor tendinopathy
- Ultrasound requires good equipment and an experienced radiologist



Prof William Meyers 2011:

- New MRI techniques now have a 93% diagnostic accuracy for the distinct injuries and augment the history and physical examination

GROIN PAIN

RADIOLOGICAL IMAGING

STUDY	KEY POINTS
Verrall et al, 2005	Important imaging tests: 1) A standing plain X-ray of the whole pelvis which includes 'flamingo' stress views 2) Careful and clinically correlated real-time US examination 3) MRI useful in detecting the location, extent and characteristics of pelvis and/or hip injury
Kunduracioglu et al, 2007	Subchondral bone marrow edema, fluid in symphysis pubis joint, and periarticular edema are the most reliable MRI findings of osteitis pubis that has a history of less than six months . Subchondral sclerosis, subchondral resorption and bony margin irregularities, and osteophytes (or pubic beaking) are the most reliable MRI findings of the chronic disease that has been present for more than six months .
Caudill et al, 2008	Difficult to make definitive diagnosis based on conventional physical examination Other methods such as MRI and diagnostic ultrasonography are often used primarily to exclude other conditions
Mr D Connell Presentation, Sep 2009	Many athletes show changes of chronic OP which may be an incidental finding. CT offers better definition of bony pathology CT shows condensation of secondary trabecula stress reaction
Garvey et al 2010, 2011	Diagnostic imaging includes an erect pelvic radiograph (X-ray) with flamingo stress views of the symphysis pubis, real-time ultrasound and, occasionally, CT scanning and MRI, limb leg measurement and test injections of local anaesthetic / corticosteroid. CT can be a useful adjunct to the evaluation of patients presenting with chronic undiagnosed groin pain Experienced clinical judgment remains a critical element in the diagnostic pathway
Zoga et al, 2010	Imaging, and in particular MRI, should play a primary role in the workup, diagnosis, and treatment of athletic pubalgia

GROIN PAIN

RADIOLOGICAL IMAGING

STUDY	KEY POINTS
Ansele et al, 2011	Careful clinical examination allows the optimal use of MR imaging and MR arthrography to evaluate the articular, osseous, tendinous, and muscular structures
Robinson et al, 2011	Article reviews the clinical, anatomical, and biomechanical basis of pubalgia and relates it to the potential imaging findings and subsequent management This condition remains a complex clinical problem
Connell D Presentation, 2011	Inguinal hernias best detected with ultrasound
Gilmore, 2011	Both MRI and high frequency ultrasound scanning are helpful in patients with conflicting symptoms and physical signs

Summary

- **Abnormalities in all imaging modalities are seen in sportspeople who have no history of groin pain**
[Brukner and Kahn 2012]
- **MRI is very helpful for imaging the hip joint, especially to detect hip labral tears. It is the investigation of choice in pubic related groin pain and stress fractures of the neck of the femur**
[Brukner and Kahn 2012]

- **Radiographic imaging may be a useful adjunct to the evaluation of patients presenting with chronic undiagnosed groin pain**

Experienced clinical judgment remains a critical element in the diagnostic pathway

GROIN PAIN

GENERAL

STUDY	KEY POINTS
Walden et al, 2005; Giza et al, 2005; P Braun, 2007; Gabbe et al 2009; Choi et al, 2010	0.5 – 25% of all football related injuries
Mens et al, 2006	Groin pain was bilateral in 41% of athletes
Holmlich, 2007	Multiple entities are present in well over a third of patients
Holmich 1999, 2000, 2007	58% adductor related; 35% IP; 7% other clinical entities; 33% had co-existing pathologies
Bradshaw et al, 2008	Hip pathology (50.4%) was the most common form of injury, with pubic pathology seen in 21% of cases
Caudill et al, 2008	Many studies have identified a relationship between hip joint ROM, hip abductor and adductor strength, core muscle weakness, previous history and the onset of, or reporting of, groin injuries... but the evidence for a causal association is not strong. The same mechanisms that create sports hernias may also lead to OP, Pubic bone oedema or hip adductor tendinosis, supporting the likelihood of co-existing injuries whether or not a sports hernia exists.
Werner et al, 2009	Re-injury in the hip/groin region causes significant longer absence than the index injury Diagnosis of groin injury still relies to a large extent on clinical examination Value of Radiological examinations and the use of independent radiologists should be investigated further
Gabbe et al, 2009	The elite junior participation period should be targeted for research to identify modifiable risk factors for the development of hip/groin injuries
Tyler et al, 2010	Groin strain 10 to 18 injuries per 100 soccer players
Garvey et al, 2010	Study highlights the fact of Pubic joint injury as the underlying pathology
Minnich et al 2011	Understanding the complex lower abdominal, pelvic and hip anatomy and pathophysiology of sports hernias is crucial for making an accurate diagnosis and providing appropriate Rx options

GROIN PAIN

GENERAL

Summary

- **These findings of multiple abnormal clinical entities tempt one to speculate that one clinical entity likely precedes other developing entities.**
- **Need trials where clinical entities are correlated with systemic investigation including MRI and ultrasonography**

Experienced clinical judgment remains a critical element in the diagnostic pathway

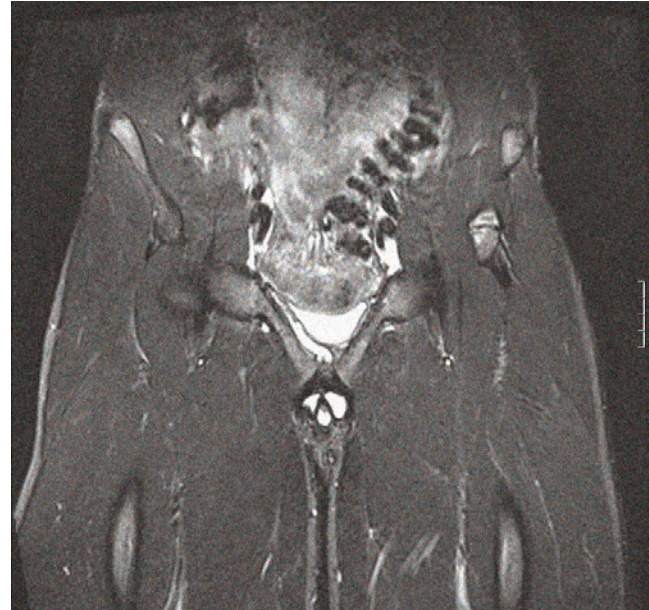
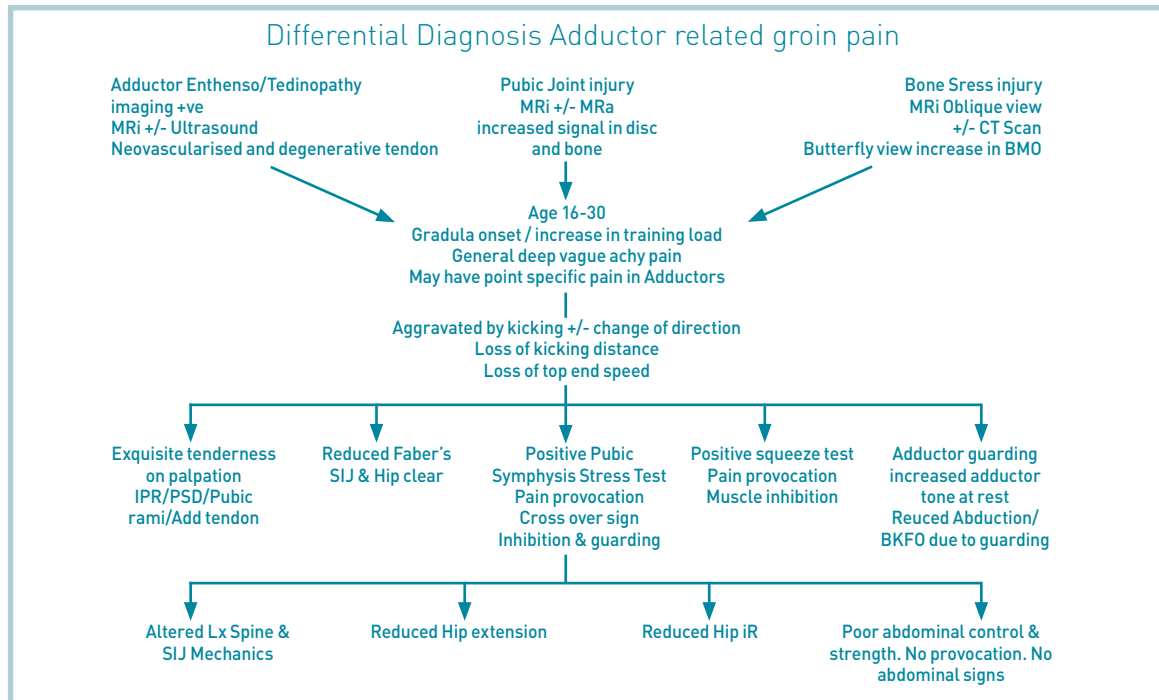


Image courtesy of Dr Richard de Villiers

GROIN PAIN DIFFERENT PATHOLOGIES

ADDUCTOR MUSCLES: Longus/Brevis/Gracilis/Pectineus



Sporting Hip & Groin Algorithm's Nov 2011 ©James Moore

GROIN PAIN DIFFERENT PATHOLOGIES

ADDUCTOR MUSCLES: Longus/Brevis/Gracilis/Pectineus

Adductor muscle injuries are present in 13%-70% of Groin injuries.



Prof Ernest Schilders 2012:

- Adductor strengthening is an essential part of the treatment at prevention level, as part of conservative treatment or post-surgery rehab.
- A primary adductor dysfunction

is always associated with strength loss. Adductor pain without strength loss is commonly associated with a hip condition such as dysplasia or femoroacetabular impingement. It is advisable always to perform pelvic Xrays with every athlete that

presents with chronic adductor pain. The majority of athletes with primary adductor pain can't kick a ball. When an athlete can kick a ball, presents with adductor pain and has problems with pivoting, we are more likely dealing with a hip problem.

STUDY	KEY POINTS
Tyler et al, 2001	Pre season Hip adduction strength was 18 % lower in NHL players who subsequently sustained groin strains compared with uninjured players
Orchard 2003	Recurrent Adductor strains common = 22% in AFL
Arnason et al, 2004	Predictor risk factors: Previous groin strains Decreased ROM in hip abduction
Schilders 2007	Types of Acute Adductor injuries = Apophysial Injuries Bony Avulsion Avulsion fibrocartilage (entheses) Tear at the MT junction
Ibrahim et al, 2007	A reduced pre-season, Hip joint ROM was associated with the development of Adductor strain injuries during the season

GROIN PAIN DIFFERENT PATHOLOGIES

ADDUCTOR MUSCLES: Longus/Brevis/Gracilis/Pectineus

STUDY	KEY POINTS
Dimitrakopoulou et al, 2008	Isolated avulsion injury of the origin of Adductor Longus through its fibrocartilagenous enthesis has not been described previously Rx = Acute surgical repair, taking into account anatomical location, degree of injury and level of athlete
Charnock et al, 2009	The Adductor longus appears to be at risk of strain injury during its transition from hip extension to hip flexion
Philippon et al 2009	Athletes with an acetabular labral tear without surgical Rx possess hip adductor deficit on their involved side Future study to investigate hip abductor and adductor strength in functional positions required
D Lloyd 2009	Inguinal ligament release not a Treatment for Adductor strain, although adductor symptoms do improve after a release
Thorborg et al 2009	A side-to-side eccentric hip adduction strength symmetry cannot be assumed in soccer players, since eccentric hip adduction is greater on the dominant side. Knowledge of a side-to-side eccentric hip adduction strength difference is relevant
Schilders, 2009	In recreational athletes, it makes sense to do a pubic cleft injection for an adductor enthesopathy regardless of the findings on MRI, whilst in professional athletes the MRI has a predictive value for the outcomes of the injections. Professional athletes with clinical and MRI proven enthesopathy have a less good long term outcome with a pubic cleft injection.
Crow et al, 2010	Reduced hip adductor muscle strength preceded the onset of groin pain and was further reduced at the time of the onset of groin pain
Engebretsen et al, 2010	Weak adductor muscles are an intrinsic risk factor for groin injuries. Adductor squeeze test dynamometer strength reduced prior to onset of groin injury
Dimitrakopoulou et al, 2010	High-level rugby player with severe groin pain following a partial rupture of his left adductor longus enthesis. Assessments revealed a large bony spur/enthesophyte at adductor longus origin. Successful surgical resection of the active bone formation.

GROIN PAIN DIFFERENT PATHOLOGIES

ADDUCTOR MUSCLES: Longus/Brevis/Gracilis/Pectineus

STUDY	KEY POINTS
Ikeda et al, 2011	Adductor Longus activity between side foot kicks and instep kicks were different Better definition of AL function during kicking provides a basis for improved insight into soccer player performance, injury prevention and rehabilitation
Connell, Presentation 2011	Adductor Longus dysfunction may result in instability and anterior subluxation of the symphysis – ‘functional release’
Thorborg et al, 2011	Eccentric hip abduction strength was greater in soccer players than matched controls, but soccer does not seem to induce a similar eccentric strength adaptation in the hip adductors
Schilders, Presentation 2012	97% return to the same level of sport after a partial adductor release in group of 43 professional soccer and rugby players. Majority returned to competition after 6 weeks. Minimal invasive.

Summary

- **Eccentric hip adduction and abduction strength plays an important role in prevention and treatment of Groin injuries in football players**
- **Eccentric Hip adduction is greater on the dominant side**
- **In soccer players with pubalgia, adductor dysfunction is a more frequent MRI finding than “osteitis pubis” / pubic joint dysfunction.**
- **Both entities are mechanically related and ‘osteitis pubis’ (pubic joint dysfunction) and adductor dysfunction frequently coexist. Adductor dysfunction most likely precedes the development of “osteitis pubis” in soccer players.**
(Cunningham et al, 2007)
- **This highlights the pubic joint as the primary issue to be dealt with.**
- **Adductor strength may be an important objective outcome for Prevention, Rehabilitation and to assess Return to Play readiness.**



James Moore 2012:

It is important to highlight the difference between an Anatomical / Pathological description versus a Functional description.

GROIN PAIN DIFFERENT PATHOLOGIES

PUBIC JOINT

STUDY	KEY POINTS
Fricker et al 1991	No good scientific evidence that surgical intervention or Injections improve outcome
Rodriguez et al 2001	A 4-stage diagnostic criteria system was helpful in determining the course of treatment Athletes who participated in this conservative management program appeared to return to full sport participation earlier and with fewer restrictions
Lovell 2006	MRI pre season: 61% of 19 junior footballer had moderate to severe BMO with no symptoms. Therefore does BMO precede symptoms? Requires research
Pham and Scott 2007	Osteitis and osteomyelitis Pubis presents as acute Abdominal pain.
Verral 2008	The term OP is inaccurate. MRI suggests Bone stress response
Meyers et al, 2000; Genitsaris et al, 2004; Kluin et al, 2004; Hagglund et al, 2006; Tyler et al, 2010	Athletic Pubalgia - Largely a clinical diagnosis of exclusion. Defined as an injury to the Rectus Abdominus insertion onto the Pubic symphysis, often accompanied by injury to the conjoined tendon insertion and the adductor longus insertion to the pelvis. Distinctive feature of this disorder is subtle pelvic instability and accompanying compromise of the transversalis fascia, eventually leading to incompetency of the post inguinal wall. Possible cause = muscle imbalance between Adductor muscles and abdominal muscles.
Paajanen et al, 2011	MRI showing bone marrow oedema seen in Symphysis Pubis is not always correlated with Clinical symptoms.
Muschawek, Meyer, Presentations 2011	Athletic Pubalgia / Sports Hernia: Unilateral pain in most cases. 40% progress to bilateral. Chronic Pain in region of pubic tubercle and inguinal region

GROIN PAIN DIFFERENT PATHOLOGIES

PUBIC JOINT

Summary

- **It is suggested that the radiological consequence of bone marrow oedema in sport represents load and nothing more and is part of mechanotransduction adaptation of the osteocytes in the bone in response to increased activity. The radiology needs to be balanced with the physical examination, to determine the true nature of the findings.**
(James Moore 2011)
- **Studies needed to show whether the increased signal / presence of BMO is a pre-cursor to the development of Groin pain.**

This would fit with the hypothesis that BMO and adductor issues are part and parcel of Pubic Joint Injury

GROIN PAIN DIFFERENT PATHOLOGIES

OTHER AREAS

STUDY	KEY POINTS
Holmlich 2007	Ilio Psoas related groin pain was found in 58% of athletes This implies that as 20% of this was secondary and tertiary pathology, that Psoas is a guarding muscle that becomes over-active in response to Pelvic overload , and is invariably not the primary pathology ● Routine assessment of IP in Screening assessment
Tipton et al 2008	Obturator neuropathy The best test for diagnosis is by electromyography (EMG) and can be confirmed by a local nerve block. Surgical decompression of the nerve in certain instances
Bardakos and Villar, 2009	Proposed functions of Ligamentum Teres with no consensus: Mechanical – Stability and Proprioception / Co-ordination Biological – Nociception / Vascularity to femoral head / Distribution of synovial fluid Note: Numerous similarities to the ACL of the knee: ● Recognised as a significant potential source of pain and mechanical symptoms arising from the hip joint. ● Arthroscopy remains optimum method of diagnosing lesions of the LT ● The use of surgical procedures that sacrifice the LT as in surgical dislocation of the hip, should be carefully considered
Stewart et al 2009	The Psoas Major was larger on the side of the dominant kicking leg in elite footballers at all 4 vertebral levels. Additional investigation into the underlying mechanisms of the observed differences in PM muscle size could help to develop Rx and rehab programmes (aimed at reducing the incidence of LBP)
Rompe et al 2009	In subjects with Greater Trochanter pain syndrome , corticosteroid injection provided short term (1 month) relief, but stretching and strengthening or low energy radial shock wave therapy were more successful for long term Rxs (4 – 15mths)
Steinbrueck et al 2010	14 year old boy played soccer 5 x a week No study has described an apophyseolysis of the Greater Trochanter without a high energy trauma that required surgical stabilisation to achieve pain free, normal function.

GROIN PAIN DIFFERENT PATHOLOGIES

OTHER AREAS

STUDY	KEY POINTS
Hides et al 2010	IlioPsoas: Asymmetries are common in AFL players. Normal adaptation?
Michael Reiman, 2010	Trochanteric Bursitis: Insidious onset. Strengthen Gluts
Botser et al 2011	The incidence of tears of the Ligamentum Teres is defined using the Gray and Villar classification, as well as a new descriptive classification that categorizes the LT according to the amount of tearing.
Timothy Dancy Steadman Hawkins Clinic, Presentation June 2011	<p>Ilio Psoas strain / bursitis US guided injections helps for 2 – 8 months</p> <p>Trochanteric Bursitis 1 injection = 70% curative 2 injections = 90% curative</p> <p>Apophysitis / Avulsion 90% boys - 14 – 17 years old Surgery for Ischial tuberosity avulsion →2cm</p>
Connell D, Presentation Sep 2011	Rectus Abdominus Musculo fascial injury: Asymmetrical hypertrophy of Recti; Caudal epimysial tears of hypertrophied muscle; intramuscular haematoma; Muscle fibres retraction
Dr Ruth Lovegraven Jones 2011	If one has cleared all other signs of Groin pain consider the Pelvic Floor

TAKE HOME MESSAGE: One must always bear in mind the associated structures around the pelvis and the entire kinetic chain

GROIN PAIN MANAGEMENT

SIGNIFICANT TESTS

STUDY	KEY POINTS
Verral et al, 2001	Useful clinical tests to help establish the diagnosis are the pain provocation tests such as the bilateral adductor test and the Squeeze test.
Hogan 2003	Squeeze test (compared with with baseline) Pubic symphysis stress tests Adductor muscle tone – bent knee fall outs
Verral et al, 2004,2005	Squeeze test; Single adductor test; Bilateral Adductor test Squeeze test is specific – 88%
Holmlich et al, 2004	Squeeze test: Moderate reliability in manually assessing the strength of a maximal hip adduction contraction.
Malliaras et al, 2009	<ul style="list-style-type: none"> ● Reliable measures of hip flexibility (bent knee fall out, hip internal and external rotation) and strength (squeeze test, hip abduction) were identified among junior football players. ● Force production on the squeeze test may discriminate between junior football players with and without longstanding groin pain.
Small 2006; Hogan 2006	Pubic Overload: Thomas Test; Squeeze test after Rx and training
Widler et al, 2009	The side lying body position offers the most valid and reliable assessment of unilateral hip abductor strength.
Fulcher et al, 2010	Good reliability using a sphygmomanometer or dynamometer
Hanna et al, 2010	Isometric strength of the hip flexors and adductor muscles was measured using a handheld dynamometer . This study establishes reference ranges and predictive equations for maximal isometric contraction strength of the hip flexors and adductor muscles in non-injured adult male association football players. This information will assist assessment and management of an athlete's return to play following injury
James Moore, 2011	Fall out test; Squeeze test (0, 60, 90 degrees of hip flexion); Pubis Symphysis stress test (PSST); Adductor squeeze test in bilateral SLR
Ferber et al 2012	Thomas test for Ilio-Psoas

GROIN PAIN MANAGEMENT/ SIGNIFICANT TESTS

Summary

- **Adductor strength is a clinical indicator used in both Injury Prevention and Rehabilitation, and should be monitored**
- **45 degrees of hip flexion provides optimal force and adductor muscle activity during the Adductor Squeeze Test.**

Further research required when assessing the clinical usefulness of these tests

CONSERVATIVE MANAGEMENT



Identify and reduce the sources of increased load on the pelvis (Brukner and Kahn 2012)

STUDY	KEY POINTS
Verrall et al, BJSM 2001	Cx Rx or surgery? No consensus BUT...if chronic groin pain Rx Cx - 12 weeks. This study shows excellent results re RTP with Cx Rx
Tyler et al, 2002	A therapeutic intervention of Pre-season strengthening of the Adductor muscle group appears to be an effective method for preventing adductor muscle strains in Professional ice hockey players
Topol 2005	Dextrose prolotherapy showed marked efficacy for chronic groin pain in this group of elite rugby and soccer athletes (91.7% RTP at a mean of 9 weeks)
Verral et al, 2007	12 weeks rest from WB excs (in addition to muscle strengthening and core stabilisation) yielded comparable results to other studies using prolotherapy, injections, cortico-steroid injections and surgery.

GROIN PAIN MANAGEMENT

CONSERVATIVE MANAGEMENT

STUDY	KEY POINTS
O'Sullivan and Beales (Part 1 and 2), 2007	Outlines the practical clinical application of a classification model for Pelvic Girdle Pain disorders and the underlying clinical reasoning processes inherent to the application of this model
Topol and Reeves 2008	Athletes returned to full elite-level performance in a timely and sustainable manner after regenerative injection therapy using dextrose. RT unrestricted sport occurred in an average of 3 months. (1 – 5 months)
Garvey et al, 2010	A period of Cx Physical therapy is mandatory and reconstructive surgery is only indicated if 3 – 6 months of specialist groin pain physio has failed. After surgery, an ongoing minimum of 3 months core strengthening is implemented to maintain pelvic stability and to restore function.
Choi et al, 2011	Rx options depends on type and severity of the case – no clear consensus Based on available evidence first line therapy in Rx of OP should consist of Cx Rx and / or Rx with injections. Further studies needed.
Myers, Presentation Dec 2011	Specific core stability programme Steroid injections/ Anti Inflammatories PRP injections – limited success
Brukner and Kahn 2012	Neoprene shorts – The mechanism of the action of compression shorts remain unclear.

GROIN PAIN MANAGEMENT

REHABILITATION

STUDY	KEY POINTS
Kapandji 1991 Netter 1994	'Rotator cuff of hip' (Piriformis / Obturator internus/ externus) 'Deltoid' of hip - Abductors/ TFL
Tyler et al, 2001	Muscle imbalance - Hip Add to Abd strength ratio - Weak abdominals Need for Pelvic stability /strength
Tyler et al, 2002	Adductor muscle programme emphasising eccentric exercise
McCarthy and Vicenzino, 2003	'Rx of OP via the pelvic floor muscles' This study highlights the importance of muscle forces attached to the pelvis Also the importance of PNF type stretches most effective, not vigorous static stretching
Toronto Centre for Sports Medicine and Preventative Health	A strengthening programme aimed at keeping the adductors at 80% of the strength of the abductors significantly reduced the incidence of injuries in hockey players
Peter Braun 2007	Cornerstone of Rx is relative rest from aggravating activities and a rehab programme incorporating strengthening and stabilising excs
Verral et al, 2007	No consensus re Cx Rx or Surgery If chronic groin pain, Cx Rx MUST be 12 weeks
Caudill et al, 2008	Need EB post-surgical rehab and conditioning progressions and more standardized patient outcome and activity level assessments. Post surgical recovery time for patients who underwent open repair was 17.7 +/- 13.1 weeks compared to 6.1 +/- 4.5 weeks for Laparoscopic repairs
Garvey et al 2010	Minimise pre-existing risk factors and compensatory strategies - Implement core stabilisation excs - Maintain good motor control and strength around the pelvis, particularly in single-leg stance

GROIN PAIN MANAGEMENT REHABILITATION

STUDY	KEY POINTS
Tyler and Slattery, 2010	<p>Excellent overview of Physio Rx and Rehab With the use of modalities and manual techniques, pain can be reduced and function restored. However the highly skilled Clinician is trained to look at the “linkage” between the trunk and all parts of the lower extremity Thus when restoring normal pain free function is difficult, the areas above and below the hip joint can provide the answers.</p>
Graham et al, 2011	<p>Gluteus medius and Adductor longus muscles showed decreased activity in the groin sufferers group. The adductor longus decrease correlates with current literature, however the decreased activation of Glut Medius suggests that this muscle group should be integrated into the groin rehabilitation</p>
Philippon et al, 2011	<p>Restoration of Gluteus Medius muscle function is essential to normal muscle function. Also useful information for non op Rx or Rehab after other hip surgical procedures</p>
Morrissey et al, 2012	<p>Football athletes with groin pain exhibit significantly altered coronal plane muscle activation with comparison to uninjured subjects. These findings need to be taken into account when planning rehabilitation for these athletes.</p>
Dr Geoff Boyle, 2012	<p>Must correct imbalances around the hip Look at all the Glut muscles, External rotators, Entire Core etc...not just the Adductors Need pelvic symmetry Muscle energy techniques excellent as Rx tool Tight Adductors = Symphysis Pubis under stress. Look at the functional requirements of the athlete.</p>

CONSERVATIVE MANAGEMENT

Summary

- Establish a benchmark
- Minimise pre-existing risk factors and compensatory strategies
- Commence a global strengthening programme.
- Early loading for tissue regulation and pain reduction
- Progress to dynamic loading – stress / strain / elastic
- Integrate dynamic loading – speed
- No pain during exercise
(pubic pain can increase Adductor tone)
- Respect pain post exercise
- Facilitate abdominals/adductors as PS stabilizers.
- Improve lumbo-pelvic stability
- Balance the hip and pelvis – total hip strength
- Regain effective muscle strength without stressing PS
- Maximise the ROM in the hips especially internal and ext rotation
- Gradual Progression based on objective functional and clinical markers
- Objective criteria required for RTP
- Maintain adequate fitness by cross training (bike, swim, rower)
- Commence a single leg stance proprioceptive and strengthening program.
- Re-evaluate every 2 weeks
- Time frame to consider surgery
(Dr Tom Cross, A Hogan, Moore J, et al.)

GROIN PAIN MANAGEMENT

SURGICAL

Dr Muschaweck 2011:

- Minimal Repair technique: Minimal procedure with maximal effect.
- The common surgical procedures are too invasive to treat a sportsman's groin. With the Minimal Repair technique, no sound structures are destroyed, only the defect is repaired.
- To avoid a chronic pain syndrome, the sportsman's groin should be treated with the Minimal Repair technique within 4-6 weeks after diagnosis.

Mr David M Lloyd 2011:

- Sportsman's groin pain in elite athletes is not caused by a hernia
- Sound anatomical knowledge and clinical examination are paramount
- Most pain is caused by tension and inflammation around the pubic tubercle
- Releasing the inguinal ligament with keyhole surgery releases the pain
- Most athletes return to their sport within 2 – 4 weeks

Mr Gerry Gilmore 2011:

- Groin disruption is not a hernia and repairing it like a hernia with a mesh does not relieve the symptoms and further surgery is often required
- Meticulous repair of each element of the disruption, using five-layered suture technique restoring normal anatomy. A fine prolene darn together with inguinal ligament tenolysis (Marsh Modification 2010)
- Professional sportsmen can expect to be playing at 4 weeks

Prof William Myers 2011:

- Patients and others should be very leery of "one size fits all" operations such as laparoscopic or open mesh hernia repair, minimal repair surgeries. These procedures may be a band-aid and not a long-term solution; and may not be effective at all. On the other hand, some of these procedures may be successful for particular injuries. Critical readers of literature should pay attention to definitions of success and degree of compulsive follow-up of both surgical and non-surgical patients, as well as anatomic precision in the descriptions of the injuries.

GROIN PAIN MANAGEMENT

SURGICAL

Is there a true Hernia?

There is controversy regarding the prevalence of a true hernia

- Is there a real surgical entity? How common is gross disruption?
- Does the inguinal ligament complex become stretched/ torn under chronic shear stresses?
- Do nerves become sensitized/chemical mediators activated?
- Is there a role for denervation?

(David Connell, 2009)

Various surgical approaches to groin pain have been described including:

- Inguinal hernia repair with or without mesh insertion
- Laparoscopic TEP (totally extraperitoneal endoscopic) treatment
- Laparoscopic TAPP (transabdominal preperitoneal hernia repairs
- Rectus abdominus reattachment
- Adductor tenotomy
- Shouldice repair

GROIN PAIN MANAGEMENT

SURGICAL

STUDY	KEY POINTS
Meyers 2000	Partial adductor tendon release
Holmich 2003	Hip flexors on the affected side were significantly weaker than non involved side prior to surgical repair (post inguinal wall insufficiency) possibly due to pain inhibition.
Orchard et al, 2004	Stress shielding as a cause of tendinopathy is supported by the clinical success of operative release of adductor Longus. The surgery releases the superficial section of the normal adductor longus tendon at a point distal to the insertion. This may have the effect of transferring stress from the superficial section of the tendon to the stress shielded deeper portion.
Orchard et al,2005	Various surgeries to the pubic region may achieve results by <ul style="list-style-type: none"> - correcting a force imbalance at the pubic symphysis and surrounding pubic rami created by abnormal adductor and abdominal muscles - reducing compartment pressures - enforcing a rest period and gradual resumption of activities
Harmon 2007	Laporoscopic repair may enable athletes to progress more quickly during rehab and ultimately RTS faster than open repair
Caudill et al, 2008	Surgery seems to be more effective than Cx Rx and laporoscopic techniques generally enable a quicker recovery time than open repair
Gilmore, Presentation 2008	Repair each element of disruption: <ul style="list-style-type: none"> - Torn external oblique aponeurosis and torn Conjoint tendon from pubic tubercle. - Dehiscence between conjoint tendon and inguinal ligament dilates superficial inguinal ring

GROIN PAIN MANAGEMENT

SURGICAL

STUDY	KEY POINTS
Muschawek 2009 FA Presentation	<p>Cx Rx: NSAID and High dose (combined with Vit B) Surgery – Minimal repair with maximal effect. Return to sport in 7 days</p> <p>OP: To avoid Chronic pain syndrome Recurrence rate 0 – 0.3% (2, 5 Year FU)</p> <p>Criteria:</p> <ul style="list-style-type: none"> - No hernia - Distinct protrusion of transverse fascia during Valsalva manouver - Compression of an afferent nerve
Lloyd et al, 2008, 2009 Mann et al, 2009	<p>Surgery: Laparoscopic inguinal ligament tenotomy in conjunction with soft non –reactive mesh. Divide scar tissue, inguinal ligt, pectineal fascia</p> <p>Laparoscopy because: Excellent views of the anatomy Different perspective of causes and pathology Challenges standard doctrine</p> <p>Allows early and full rehab Excellent for recurring pain following groin surgery</p> <p>Lloyd makes distinction between groin pain above the inguinal ligt and groin pain below the ligt.</p>
Mr Snook, FA Presentation 2009	<ul style="list-style-type: none"> - Conservative Rx to temporary relieve pain - 8 weeks wait - USS Groin. Floppy posterior inguinal canal wall - Open procedure with mesh

GROIN PAIN MANAGEMENT

SURGICAL

STUDY	KEY POINTS
Garvey, 2010	Using a specific regimen of groin reconstruction and post-operative rehabilitation, a player would be anticipated to return to their pre-injury level of activity approximately 3 months after surgery
Bisgaard et al, 2010	Lichtenstein repair for an indirect inguinal hernia reduces the risk of recurrence in young men 18 -30 yrs compared with sutured repair
Szitkar et al, 2010	Laparoscopic mesh repair of ventral abdominal wall hernias is routinely performed. Mesh detachment and migration within the abdominal cavity is a late complication of this procedure. Complication rare and often overlooked
Hamouda et al, 2010	Mesh erosion into the urinary bladder following laparoscopic inguinal hernia repair, is this the tip of the iceberg? With large case series of mesh non fixation being reported in world literature, it may be that the incidence of this complication, will increase in the future?
Kirchoff et al, 2010	Detection of recurrent hernia and intra-abdominal adhesions following incisional hernia repair: a functional cine MRI study. This would be suitable for FU studies in patients after hernia repair to detect and evaluate the implanted meshes.
D Connell, Presentation 2011	Repair each element of the disruption Restoration of normal anatomy. Six layered structure repair of the inguinal region Possibly adductor tenotomy if chronic adductor symptoms Intensive Rehab programme RTS: 4 – 6 weeks 97% success in Pro Footballers

GROIN PAIN MANAGEMENT

SURGICAL

STUDY	KEY POINTS
Paajanen et al, 2011	Laparoscopic surgery for Chronic Groin pain in Athletes is more effective than non-operative treatment
James Moore, 2011	Surgical Options: Partial Adductor Tenotomy Inguinal release / repair. Bone resection / stabilisation (Orchard 2004). Indications for Tenotomy: Persistent adductor tightness /pain; Limited time frames / external pressure; Chronic degenerative symphysis

GROIN PAIN MANAGEMENT

SURGICAL

Summary

- The past thinking of “it’s just a hernia” is passé and has been replaced with science-based consideration and other factors.
- Surgical techniques have rapidly evolved since Eduardo Bassini proposed his first successful reconstruction of the inguinal floor. The various adaptations of his technique, however, did not result in a substantial reduction in the number of recurrences.

The tension-free repair, introduced by Irving Lichtenstein, caused a dramatic drop in the recurrence rate and became the procedure of choice. Since the introduction of laparoscopic techniques, these methods have become equally accepted for inguinal hernia.

[American Hernia Society Symposium on Sports hernia 2011]

- Post operative Rehabilitation programmes varied from 3 – 12 weeks.
- No consensus as to ideal operating technique
- Serial patient outcome measurements are needed to base intervention success on factors other than return to sports activity.
- Operate on asymptomatic side?

HIPS INTRODUCTION



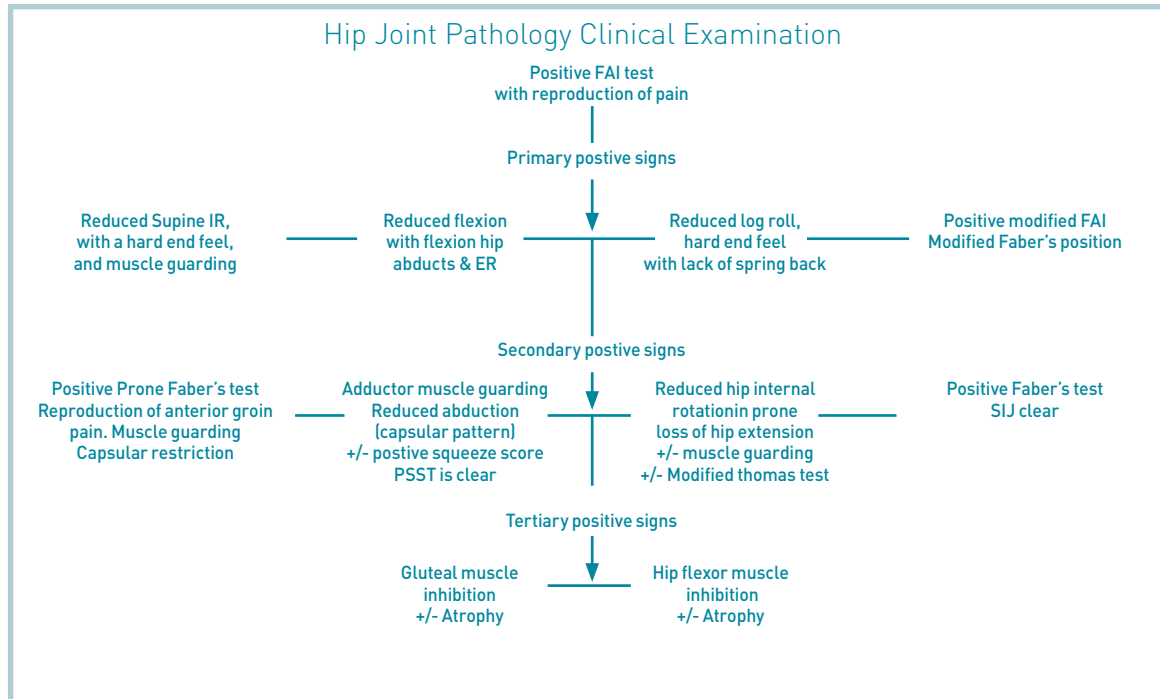
Prof Karim Khan:

- Three Systemic reviews have examined outcomes following hip arthroscopy. They each concluded that short term outcomes are generally promising for hip arthroscopy treatment of FAI and labral pathology, although outcomes are generally poorer if significant chondropathy is observed.

Bruckner and Khan, Clinical Sport Medicine, 4th Edition, Chapter 28

- Further long term studies are required
- Combination hip and pelvic injuries occur in about 14% of the population (Dr William Meyer, 2011)
- The prevalence of acetabular labral tears in some populations presenting with hip or groin pain has been reported to be between 22% and 55%
- Labral tear = 87% of subjects reported anterior groin pain.

HIPS INTRODUCTION



Sporting Hip & Groin Algorithm's Nov 2011 ©James Moore

HIPS TESTS

STUDY	KEY POINTS
Phillipon et al, 2006	There is a significantly reduced range of motion in the symptomatic side of patients with FAI. There are differences in flexion (9 deg), internal rotation (4 deg), adduction (3 deg). The hip impingement test was positive in 99% of cases, and FABER's in 97%
Clohisy et al, 2006	The anterior impingement test reproduced anterior groin pain in 88% tested. 69% of patients had a positive FABER test, and 56% had a positive resisted straight leg raise
Philippon et al, 2009	Use of pre op baseline clinical, special tests and functional tests prior to surgery important
Maslowski et al, 2010	<ul style="list-style-type: none"> ● IROP (internal rotation over pressure) and FABER may be worthwhile components of the clinical evaluations of hip pain to determine intra-articular hip pathology. These tests are nonspecific and therefore not necessarily negative in the absence of intra-articular hip pathology. ● These hip provocation maneuvers are a useful part of an evaluation that includes history, further examination findings, and other diagnostic studies
Allen and Butler, Comfort and Abrahamson Book, 2010	Modified Thomas Test – this can be a differential indicator of hip flexor related pathology on the stretch side, or hip impingement on the compression side
Netters Orthopaedic Clinical examination, 2011	Generally special tests of the hip have not been demonstrated to have been specially helpful in identifying specific pathologies
Burgess et al, 2011	<p>“The validity and accuracy of clinical diagnostic tests used to detect labral pathology of the hip: a systematic review.”</p> <ul style="list-style-type: none"> - MRA consistently performs better than MRI and should be the first choice for imaging - CT also showed high accuracy levels for the few studies identified
Manual therapy, 2011	<p>The validity and accuracy of clinical diagnostic tests used to detect labral pathology of the hip: a systemic review.</p> <ul style="list-style-type: none"> ● Results showed Magnetic Resonance Arthrography to consistently outperform MRI. CT also showed high accuracy levels for the few studies identified

HIPS TESTS

Summary

- **Studies investigating physical tests were of poor quality demonstrating a need for further research in this area.**
- **Negative test results are of more use in ruling OUT the condition, given the high reported sensitivities of many tests**
- **A battery of tests should be utilised to improve the accuracy of your clinical reasoning**

Burgess et al, 2011

HIPS SURGERY

STUDY	KEY POINTS
Kapandji 1991, Netter 1994	“Rotator cuff” of hip - Piriformis / Obturator internus/ externus. Abductors / TFL = “Deltoid” of hip
Binningsley 2003	“Tear of the Acetabular labrum in an elite athlete” Arthroscopy is a safe and effective Rx. Expected to return to full elite competition in 12 weeks
Frisbie et al, 2003	Microfracture techniques appear to improve clinical functionality, volume of repair tissue and augment Type 2 Collagen content but Aggrecan content is less than ideal
Byrd 2005	It is unknown whether early diagnosis necessitates early intervention. For some, arthroscopy offers a distinct advantage over traditional open techniques
Narvani et al, 2003 Verral et al, 2005	<ul style="list-style-type: none"> ● Acetabular labral tears are a common cause of groin pain in athletes. ● Reduction in hip ROM was evident in athletes with chronic groin injury.
Lewis and Sahrman 2006	<ul style="list-style-type: none"> ● Once Acetabular Labral Tears are diagnosed, Cx Medical Rx has not proved to be effective ● Because Labral tears have been associated with a higher risk for joint degeneration, this area warrants further investigation, especially with regards to preventative, early detection and appropriate physical therapy and medical Rx
Bohnsack 2006	Persistent sports related groin pain was frequently caused by intra-articular hip disorder. Following hip arthroscopy athletes RTS
Shetty and Villar 2006	<ul style="list-style-type: none"> ● Hip arthroscopy has seen several advances and as with any procedure is not without its risks ● With current technical advancement, it remains to be seen whether we can change the natural history of the disease process and potentially curb the progression of osteoarthritis
Crawford et al, 2006	<ul style="list-style-type: none"> ● Indications for Microfracture of the hip in athletes, include full-thickness cartilage loss or unstable flap on a weight-bearing surface ● An important contraindication is the patients unwillingness to follow the postoperative protocol and rehabilitation plan ● Early results following microfracture in the hip have been encouraging

HIPS SURGERY

STUDY	KEY POINTS
Phillippon et al, AJSM 2007	<p>“Arthroscopic Mx of FAI: osteoplasty technique and lit review”</p> <ul style="list-style-type: none"> ● In high demand athlete less invasive arthroscopic approach developed to allow improved rehab and prompt RTP
Phillippon et al 2007	<p>The athletes, mostly male and hockey players, who underwent Arthroscopic decompression followed by an individualised (and poorly described) rehabilitation period were allowed to return to play at 12–16 weeks post-operatively. 93% of the athletes returned to professional level sport.</p>
Phillippon et al, Arthroscopy 2007	<p>The ability of labral detachments to heal in an ovine model provides the rationale for additional investigations into the clinical efficacy of arthroscopic labral repair in human beings</p>
Phillippon et al 2007. Knee Surg Sports Traum Arth	<p>Open surgery = highly invasive can delay RTS Arthroscopy = 93% RT Pro level 78% remaining active at this level at a mean of 1.6 years FU</p>
Verrall et al, 2007	<p>Preliminary study demonstrates that having a hip joint restriction precedes the development of chronic groin injury and may be a risk factor for this condition</p>
Shetty and Villar 2007	<p>Non-operative treatment is likely to result in persistent symptoms. Hip arthroscopy has seen several advances and is not without risks. 50.4% - FAI most common form of injury (acute labral tears and impingement syndromes most common (Cam → Pincer)</p>
Verral et al, 2005, 2007	<p>Hypothesised that hip joint capsular twisting may create motion restrictions similar to those that repetitious throwing creates at the GH joint.</p>
Leunig et al, 1997; Murphy et al, 2004; McCarthy et al, 2006; Phillippon et al, 2008; Stahelin et al, 2008	<p>It has been suggested that FAI is a cause of Labral and cartilage damage and the Cam and Pincer impingement is believed to be the genesis of idiopathic OA</p>

HIPS

SURGERY

STUDY	KEY POINTS
Caudill et al, 2008	Reduced hip abduction and internal/external rotation ROM associated with chronic groin injury
Bradshaw 2008	Common diagnosis of groin pain subjects included acute labral tears and impingement syndromes (Cam → Pincer) ● 4 – 6% of 'Groin injuries' are hip related
Tibor and Sekiya 2008	Chondral damage: Multiple traumatic and atraumatic aetiologies: Include labral tears, loose bodies, dislocation, FAI, avascular necrosis, acetabular dysplasia, and previous slipped capital femoral epiphysis Arthroscopy to assess cartilage damage and ST pathology Microfracture can be considered in focal or contained lesions less than 2 – 4 cms in diameter on wt bearing surfaces Contraindicated: partial thickness defects; in lesions with associated bony defects; Unstable or calcified cartilage should be debrided, taking care to maintain subchondral integrity OP: Labral tear: Debride . REATTACH FAI: CAM: Osteochondroplasty Pincer: Trim acetabulum (Labrum) Rehab: Depends on Surgical procedure ● Many potential causes of hip pain have overlapping symptoms on physical exam findings
Austin et al, 2008	Excessive frontal and transverse plane hip motions may contribute to FAI. Therefore Physio interventions aimed at controlling and reducing hip adduction and internal rotation during activities may be indicated in pts who present with this movement pattern associated with hip / groin pain. Future research is required to determine the extent to which physio intervention aimed at improving hip kinematics would be effective in Rx individuals with labral injuries.
Bedi et al, 2008	A systematic review compared the outcomes of open and arthroscopic treatment of labral tears and FAI and found insufficient evidence to support open surgical dislocation as a superior procedure to arthroscopic management

HIPS SURGERY

STUDY	KEY POINTS
Smith et al, 2008	<ul style="list-style-type: none"> ● 4 causes of the initiation of labral tears have been proposed previously: trauma, hyper-laxity of the anterior capsule, dysplasia and bony impingement ● The biomechanical properties in the antero-superior region may be a contributing factor to the initiation of labral tears
Philippon et al, 2008	<p>“Arthroscopic labral repair and Rx of FAI in Hockey players”</p> <p>Early intervention after injury = less chondral damage = earlier RTS</p>
Philippon et al, 2008 Arthroscopy	<p>“Can microfracture produce repair tissue in acetabular chondral defects?”</p> <ul style="list-style-type: none"> ● 8 of 9 patients had 95% to 100% coverage of an isolated acetabular chondral lesion or acetabular lesion associated with a femoral head lesion, with grade 1 or 2 appearance of the repair product at an average of 20 months follow-up
Philippon et al, 2009 J Bone J Surg	<p>Suggested that FAI is cause of Labral and cartilage damage.</p> <ul style="list-style-type: none"> ● Predictor of outcome for FAI with associated chondrolabral dysfunction was the repair of the labral pathology ● It was recommended that a labral repair rather than debridement
Philippon et al, 2009 J Sport Rehab	<p>At 16 weeks post arthroscopic repair of the hip, pro football athlete was able to RT full preparation for sport the following season</p>
Philippon et al, 2009 Presentation	<p>Athletes with an acetabular labral tear without surgical Rx possess a hip adductor deficit on their involved side</p>
Kennedy et al, 2009	<ul style="list-style-type: none"> ● FAI alters hip and pelvic biomechanics during gait walking biomechanics of FAI
Bahr and Khan, 2009	<p>“Management of lateral hip pain”</p> <p>The absence of a uniform terminology for this common condition of lateral hip pain reflects our ignorance of both the pathology and the source of pain</p>

HIPS

SURGERY

STUDY	KEY POINTS
Byrd et al, 2009	10 year FU: Arthroscopy to address hip injuries in athletes can result in substantial improvement with durable results. However, Arthritis is a prognostic indicator of poor long term outcomes
Byrd and Jones 2009	<p>“Arthroscopic Femeroplasty in the Mx of CAM-type FAI”</p> <ul style="list-style-type: none"> ● FAI is a well recognised cause of joint damage and OA among young adults. So there should be an emphasis on injury prevention ● Imaging studies may underestimate the severity of articular loss which becomes evident during arthroscopy ● Arthroscopic evaluation – good as open according to this study, but need improved techniques and better understanding of patient selection ● Possible to have CAM morphology without CAM pathology Therefore Arthroscopic evaluation becomes important ● Surgeon must weigh the risks of performing a potentially unnecessary procedure in an asymptomatic individual with CAM morphology against the risks of allowing unchecked progression of the deleterious process ● Thus early surgical consideration and opinion is vital even if intervention is not warranted or even delayed ● Microfracture for grade 4 lesions with healthy surrounding cartilage
Philippon et al, 2009 Presentation	Patients with underlying FAI = Restricted Internal rotation = Adductor weakness
Byrd and Jones 2009	<ul style="list-style-type: none"> ● FAI is not a cause of hip pain per se ● It is simply a morphological variant predisposing the joint to intra-articular pathology that then becomes symptomatic

HIPS SURGERY

STUDY	KEY POINTS
Yen and Kocher 2010	<p>“Chondral lesions of the Hip: microfracture and chondroplasty”</p> <p>PAST: Indications for hip arthroscopy 10 years ago: diagnostic and debridement procedures</p> <p>NOW: Include</p> <ul style="list-style-type: none"> -Reconstruction and repair of the labrum -Recontouring of the acetabulum and head –neck junction -Cartilage salvage -Repair and release of the tendons around the hip joint <p>Routinely perform:</p> <ul style="list-style-type: none"> -Chondroplasty for partial thickness of articular cartilage -Microfracture for full thickness tears
Safran and Hariri 2010	<ul style="list-style-type: none"> ● A need for patient-reported hip outcome tools that assess the highest-level competitive athlete <p>So far, the modified Harris Hip Score (MMHS), the Hip Outcome Score (HOS), the Nonarthritic Hip Score (NHS), and, most recently, the MAHORN (Multicenter Arthroscopy of the Hip Outcomes Research Network) Hip Outcomes Tool (MAHORN Hip Outcomes Tool [MHOT]) were developed to fill this void.</p> <p>Hip arthroscopy outcomes research is also limited by the lack of an accurate, universally used terminology to describe the characteristics and location of intra-articular lesions.</p> <p>Hip arthroscopy is considered a safe and effective treatment for several indications, including loose bodies, labral tears, femoroacetabular impingement, ligamentum teres tears, and hip instability.</p> <p>Concomitant articular cartilage damage is a negative prognostic indicator for all hip arthroscopy indications. Arthroscopy for radiographically evident degenerative hip disease has almost uniformly poor results. For the most part, only short and midterm follow-up studies are available.</p>

HIPS SURGERY

STUDY	KEY POINTS
Haviv et al, 2010	<ul style="list-style-type: none"> ● Arthroscopic femoral head Osteochondroplasty for CAM impingement with micro fracture in selected cases is beneficial ● The outcome correlates with the severity of acetabular chondral damage ● In CAM impingement although the bony prominence at the femoral neck produces mainly mechanical limitation, it is believed that the eventual chondral damage and reactive synovitis are responsible for a significant proportion of the pain
Horisberger et al, 2010	<p>“Arthroscopic Rx of FAI in patients with Pre-operative generalized degenerative changes.”</p> <ul style="list-style-type: none"> ● Only short term results
Philippon et al, Arthroscopy 2010	<p>“Arthroscopic labral reconstruction in the hip using iliotibial band autograft: technique and early outcomes.”</p> <p>This study showed that patients who have labral deficiency or advanced labral degeneration had good outcomes and high patient satisfaction after arthroscopic intervention with acetabular labral reconstruction</p>
Philippon et al, 2010 AJSM	<p>Arthroscopic labral repair and Rx of FAI in Pro Hockey players</p> <ul style="list-style-type: none"> ● This study highlights the need for early intervention after injury to the professional hockey player ● Excellent outcome. But query Long term
Martin et al, 2010	<ul style="list-style-type: none"> ● Study offers support that clinical examination techniques used for making a diagnosis needs to be improved and standardized if they are to be useful in diagnosing specific pathologies found with arthroscopic hip surgery
Singh and O’Donnel 2010	<ul style="list-style-type: none"> ● Using hip arthroscopy, there was high satisfaction levels and return to pre-injury levels of play in all but 1 case. Post hip scores improved significantly and this improvement was maintained for up to 4 years
Yen and Kocher 2010	<p>“We routinely perform chondroplasty in cases where there is a partial thickness tear of articular cartilage. Full thickness defects are addressed with microfracture which follows closely the guidelines established for the knee. As our understanding of chondral injuries and their causes grows, future efforts will focus on prevention.”</p>

HIPS

SURGERY

STUDY	KEY POINTS
Weir et al, 2010	<ul style="list-style-type: none"> ● Radiological signs of FAI are frequently observed in patients presenting with long-standing adductor-related groin pain (LSARGP) ● As we are aware of possible hip joint pathology as a cause of groin pain, we should consider carefully different clinical examinations and their interpretation
Bannerjee et al, 2010	<ul style="list-style-type: none"> ● Results of this short term follow up study shows that sports activity after total hip resurfacing is still possible. Physical activity level increased with a shift towards low impact sports ● Hi impact sports activity decreased
Thorborg et al, 2010	<ul style="list-style-type: none"> ● HOOS can be recommended for evaluating patients with hip osteoarthritis undergoing non-surgical treatment and surgical interventions such as total hip replacement ● HOS can be recommended for evaluating patients undergoing hip arthroscopy. Furthermore, this study shows that a new PRO questionnaire focusing on the evaluation of hip and groin disability in young and physically active patients is needed ● The HAGOS questionnaire has adequate measurement qualifications for the assessment of symptoms, activity limitations, participation restrictions and QOL in physically active young to middle aged patients with long standing hip and/or groin pain
Ng et al, 2010	<p>Surgical treatment for FAI reliably improves patient symptoms in the majority of patients without advanced osteoarthritis or chondral damage.</p> <p>Early evidence supports labral refixation It is too soon to predict whether progression of osteoarthritis is delayed</p>
Ellis et al, (Briggs and Philippon) 2011	<p>Is hip arthritis preventable in the athlete?</p> <ul style="list-style-type: none"> ● May account for 2-5% of all sports injuries ● The relationship between FAI and OA is well established ● Hip and groin pain has long been associated with structural abnormalities of the femoral neck, acetabulum and labral pathology <p>More over →→→</p>

HIPS

SURGERY

STUDY	KEY POINTS
Ellis et al, (Briggs and Philippon) 2011	<p>New techniques, such as labral reconstruction, are being developed to address more complex injuries seen in athletes, while helping to protect the joint surfaces and decrease the risk of early onsite osteoarthritis.</p> <ul style="list-style-type: none"> ● The athlete's painful hip, which is becoming an increasingly more common complaint, is being identified and treated with greater chances of returning to play without compromising long-term hip function and the progression of hip osteoarthritis
Abellàn et al, 2011	<ul style="list-style-type: none"> ● The iliofemoral ligament had a significant role in limiting external rotation and anterior translation of the femur, while the acetabular labrum provided a secondary stabilizing role for these motions ● A careful repair of an arthroscopic capsulotomy should be performed to avoid increased external hip rotation and anterior translation after arthroscopy ● The labrum has a big role in proprioception of the hip along with any capsular and ligamentous structure ● Loss of integrity of these structures can lead to change in muscle function and thus increase in joint loading
Haviv and O' Donnell 2011	<ul style="list-style-type: none"> ● Arthroscopic Rx for acetabular labral tears of the hip without dysplasia or bony impingement lesions has good short – to midterm results ● The best outcome is expected in the absence of synovitis and chondral lesions
Smith et al, 2011	<ul style="list-style-type: none"> ● The findings suggest that the acetabular labrum continues to function to resist femoral head translation despite chondral-labral separation and that labral preservation, particularly with larger tears, may be important for maintaining hip stability ● Further studies are needed to determine the effect of partial labral excision on the stability ratio with the hip in provocative positions such as extension, external rotation and abduction

HIPS

SURGERY

STUDY	KEY POINTS
Blomberg et al, 2011	<ul style="list-style-type: none"> ● Cutting the IP tendon at the labrum, head-neck junction or lesser trochanter does not result in a release of the entire IP MTU ● The results of this study document that releasing the IP tendon at the lesser trochanter preserves 40% of the MTU and does not result in a complete detachment of the IP MTU
Mc Cormack et al, 2011	The authors defined the following 2 Vascular safe zones in Hip Arthroscopy: the femoral neck osteoplasty safe zone is on the anterior half of the femoral neck; the psoas tendon release safe zone is astride the middle third of the medial hip capsule
Ross et al, 2011	<ul style="list-style-type: none"> ● Acetabular rim disease is common in symptomatic acetabular dysplasia, and 63% of cases have a central compartment abnormality amenable to arthroscopic treatment
Nho et al, 2011	<ul style="list-style-type: none"> ● Arthroscopic Rx of FAI in a mixed group of High Level Athletes may result in a significant improvement in hip functional outcome: 78% of athletes were able to RTP in 1 year and 73% were able to RTP at 2 year FU
Myers et al, 2011	<ul style="list-style-type: none"> ● The iliofemoral ligament had a significant role in limiting external rotation and anterior translation of the femur, while the acetabular labrum provided a secondary stabilizing role of these motions ● These results suggest that, if injured, both the acetabular labrum and iliofemoral ligament should be surgically repaired to restore native hip rotation and translation. In addition, a careful repair of an arthroscopic capsulotomy should be performed to avoid increased external hip rotation and anterior translation after arthroscopy
Ilizaliturri et al, 2011	The clearest indication for arthroscopy after traumatic posterior hip dislocation was loose fragments inside the joint. Intra-articular damage was demonstrated in every case. Most of the patients had significant improvement after hip arthroscopy.
Bedi et al, 2011	Focal cam and/or rim osteoplasty can reliably improve hip kinematics and range of motion in patients with symptomatic FAI, particularly the limitation of internal rotation in a flexed position. A complete osteoplasty in these defined regions, through an arthroscopic or open approach, predictably improves range of motion and may help to eliminate the recurrent mechanical collision and secondary chondral injury associated with FAI.

HIPS

SURGERY

STUDY	KEY POINTS
G Tsikouris et al, 2011	The athletes with symptoms of an internal hip pain and FAI signs after a detailed clinical exam of their hip and after failure of their conservative RX, will certainly get a benefit from an arthroscopic procedure.
Naal et al, 2011	<ul style="list-style-type: none"> ● Surgical Hip dislocation for the Rx of FAI in high level athletes allows athletes to resume sports and continue professional careers at the same level for several years. Clinical outcomes in terms of subjective ratings and scores were favourable
Freehill and Safran 2011	<ul style="list-style-type: none"> ● Although a labral tear may occur with a single traumatic event, often another underlying cause may be already present, predisposing the individual to injury
Kivlan et al, 2011	<p>Response to Diagnostic Injection in Patients with FAI Labral Tears, Chondral Lesions, and Extra-Articular Pathology</p> <ul style="list-style-type: none"> - Subjects with chondral damage had greater relief from injection than those without, regardless of severity - The presence and severity of FAI and labral pathology did not influence the percent relief from injection - Concurrent extra-articular pathology did not alter the interpretation of the percent relief from injection
Bizzini et al, 2011	<ul style="list-style-type: none"> ● RT high level Ice hockey after open surgical decompression for FAI was possible in this series of 5 consecutive cases. ● Practice 6.7 months; Full participation: 9.6 months
Bedi et al, 2011	<ul style="list-style-type: none"> ● Arthroscopic osteoplasty can restore head-neck offset and achieve similar depth, arc, and proximal-distal resection with comparable efficacy to open surgical dislocation for anterior and anterosuperior cam and focal rim impingement deformity. ● The open technique, however, may allow greater correction of posterosuperior loss of femoral offset and may be favourable for FAI patterns that demonstrate considerable proximal femoral deformity on AP radiograph
Ross et al, 2011	<ul style="list-style-type: none"> ● Acetabular rim disease is common in symptomatic acetabular dysplasia, and 63% of cases have a central compartment abnormality amenable to arthroscopic treatment

HIPS

SURGERY

STUDY	KEY POINTS
Byrd and Jones 2011	The data substantiates successful outcomes in the arthroscopic management of FAI with few complications and most athletes were able to resume activities
Rylander et al, 2011	The results supported the hypothesis that surgical intervention for FAI restores more normal patterns of gait and provides objective support that the surgical procedure is useful
Marchie et al, 2011	Patients with synovial chondromatosis with hip central compartment loose bodies that were less than 10 mm benefited from hip arthroscopy. Imaging studies alone failed to establish the diagnosis in 14 of 29 patients (48%). Diagnosis was made by direct visualization via arthroscopy. For patients with grade I/II cartilage change, early diagnosis and treatment via arthroscopy helped.
Lund et al, 2011	Recognition of FAI is important, as failure to address this underlying pathology may lead to early onset osteoarthritis and subsequent hip replacement
Papalia et al, 2011	Although open and minimally invasive procedures allow athletes to return to professional sports activity, they are contraindicated in patients with severe osteoarthritis and cartilage degeneration
Kemp et al, 2011	Current evidence indicates that hip arthroscopy can significantly reduce pain and improve function in patients with intra articular hip pathology. While benefits of arthroscopy alone can persist up to 10 years post surgery, effects of osteoplasty beyond 3 years need to be established. Further studies should investigate rehabilitation in this population, and the impact of surgery on development of AO→
Schilders et al, 2011	This study shows that patients without advanced degenerative changes in the hip can achieve significant improvement in their symptoms after arthroscopic treatment of FAI. Where appropriate, labral repair provides a superior result to labral resection.

HIPS

SURGERY

STUDY	KEY POINTS
Meftah et al, 2011	Arthritis had a significant correlation with low postoperative Harris Hip Scores and satisfaction. Coexisting pathology, especially arthritis and untreated FAI, can result in inferior outcomes. Arthroscopic labral debridement of symptomatic tears in selected patients with no coexisting pathology can result in favorable long-term results. Arthritis is the strongest independent predictor of poor outcomes.
Gerhardt et al, 2012	72% of male elite soccer athletes demonstrated some evidence of radiographic hip abnormality. Cam lesions were present in 68% of men (76.5% bilateral involvement) Pincer lesions were present in 26.7% of men

Quandries

- It is easy to identify a CAM lesion. However, timing is important.
- A CAM lesion in itself is not a diagnosis or a pathology, just an observation of anatomy and a dysplastic hip.

Therefore, the identification of such anatomy needs to be married with the clinical presentation and symptoms, and only then can a decision be made.

Even then, any intervention has to be sure to help the patient, **as too early an intervention** is sometimes unnecessary as they can be managed conservatively.

However, you can **wait too long** and the pathological process of hip degeneration and early OA can progress due to the CAM, leading to no alternative but a Birmingham resurfacing.

- **Thus early surgical consideration and opinion is vital even if intervention is not warranted or even delayed**

Conclusions

- Most common symptom reported with FAI was groin pain
- FAI exists but is not a diagnosis
- Recognition of FAI is important, as failure to address this underlying pathology may lead to early onset osteoarthritis and subsequent hip replacement
- Arthroscopy works but need to select client group carefully. The surgeon must weigh the risks of performing a potentially unnecessary procedure in an asymptomatic individual with CAM morphology, against the risks of allowing unchecked progression of the deleterious process
- The Acetabular Labrum and Ilio-Femoral Ligament are vital for normal hip mechanics
Excessive removal of either in surgery can be detrimental.
- Tests in isolation are not accurate.
Need to use the imaging to be specific.
- Studies investigating physical tests were of poor quality demonstrating a need for further research in this area
- The presence of arthritis at the time of index procedure was an indicator of poor prognosis
- As our understanding of FAI and chondral injuries and their causes grows, future efforts will focus on **Prevention**
- Preliminary study demonstrates that having a **hip joint restriction** (reduced hip abduction and int/ext rotation) precedes the development of chronic groin injury and may be a risk factor for this condition
- Future research is required to determine the extent to which **Physio intervention** aimed at improving hip kinematics would be effective in treating individuals with labral injuries

GROIN & HIPS

OVERVIEW

Dr Mike Stone, 2011:

- One needs to have FU studies, with 5–10 years outcome of surgery
 - The criteria is Prevention: Core stability and Pelvic stability
- Critical readers of literature should pay attention to definitions of success and degree of compulsive follow-up of both surgical and non-surgical patients, as well as anatomic precision in the descriptions of the injuries.
 - Need to be vigilant in analysing our FU
(Dr William Meyer, 2011)
 - Currently **NO CONSENSUS** as to what specifically constitutes a specific diagnosis
 - Well-designed research studies are needed.
Only with this will we better understand sports hernia pathogenesis, verify superior surgical approaches, develop EB Screening and Prevention strategies and more effectively direct both Conservative and post surgical rehabilitation.

- The challenge lies between ascertaining the Anatomical diagnosis vs. Pathological diagnosis vs. Functional diagnosis – the interaction of the three will influence prognosis and management, whereas identification of one alone will give a bias in one direction.

(James Moore, 2011)

Is there a solution?

Dr Zafar Iqbal, 2012

There should be a base line test done at signing / pre-screening as a basis for future reference.

- In spite of minimal EBM, it seems the most pertinent point is that many of the Groin pathologies can be averted by thorough and **specific Pre-habilitation bearing in mind the entire kinetic chain and addressing total function around the pelvis above and below.**

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