The first International Dana Seminar on Pediatric and Adolescents Sports Medicine

April 11th-12th, 2011

The Department of Pediatric Orthopedics & The Pediatric Sports Injuries and Arthroscopic Surgery Service Dana Children’s Hospital, Tel Aviv Sourasky Medical Center

in cooperation with

The Israel Society of Sports Medicine

Abstract Book
Chairman:  
M. Yaniv, MD

Organizing Committee:  
T. Becker, MD  
H. Jacobi, M.Sc  
S. Wientroub, MD

International Faculty:  
M.T. Busch, MD, U.S.A  
F. Chotel, MD, France  
T. Ganley, MD, U.S.A  
D.L. Marshall, MD, U.S.A  
M.L. Murnaghan, MD, Canada

Israeli Faculty:  
R. Arieli, R.D, M.Sc  
N. Constantini, MD  
S. Diamant, MD  
L Zeitlin, MD  
Y. Hutzler, Ph.D  
D. Nemet, MD  
D. Ovadia, MD  
E. Sadres, M. Med. Fc  
R. Soferman, MD
April 11, 2011: Pediatric Primary Care Sports Medicine Topics

800-830- Registration
0830 – 0840 Opening Dr. Moshe (Muki) Yaniv

Morning Sessions 1: Children’s Exercise Physiology
Session Chair: Prof. Yoram Epstein
0840 – 0900 Physical activity and growth – Prof. D. Nemet
0900 – 0920 Children’s exercise physiology – Prof. D. Nemet
0920 – 0930 Discussion – Q&A
0930 – 1000 Strength training in youth and developmental readiness for sports – Dr. D.L. Marshall
1000 – 1045 Pre-participation evaluation panel – Dr. Constantini, Dr. Diamant, Dr. D.L. Marshall
1045-1115 Coffee break

Morning Sessions 2: The Healthy Young Athlete
Session Chair: Dr. Yoni Yarom
1115 – 1150 How to build a physical activity program for the growing athlete – E. Sadres
1150 – 1215 Overuse injuries in the young athlete – Dr. D.L. Marshall
1215 – 1245 Injuries prevention in children’s sport’s activities – Dr. D.L. Marshall
1245 – 1315 Nutritional aspects of the young athlete – R. Arieli
1315-1400 Lunch break

Afternoon Sessions 1: Injuries and Pathology in Healthy and Disabled Children
Session Chair: Dr. Ron Golan
1400 – 1420 Bone exercise and nutrition – Dr. L. Zeitlin
1420 – 1440 The management of concussion in sports – Dr. D.L. Marshall
1440 – 1500 Exercise and childhood obesity – Prof. D. Nemet
1500 – 1520 Respiratory illnesses and Asthma in the young athlete – Dr. R. Soferman
1520 – 1540 The diabetic young athlete – Prof. D. Nemet
1540-1600 Coffee break

Afternoon Sessions 2: Injuries and Pathology in Healthy and Disabled Children
Session Chair: Maya Cale'-Benzoor
1600 – 1630 The female adolescent athlete – Dr. N. Constantini
1630 – 1700 The disabled young athlete – Dr. Y. Hutzler
April 12, 2011: Pediatric Sports Injuries Topics

Morning Sessions 1: Knee and Hip
Session Chair: Dr. Gabriel Agar
0830 – 0850 The natural history of knee joint in skeletally immature patients with a diagnosis of an anterior cruciate ligament tear – Dr. M.T. Busch
0850 – 0910 Anterior cruciate ligament tear combined with other knee injuries (medial collateral ligament, meniscus, chondral lesions) – Dr. T.J. Ganley
0910 – 0940 The role of conservative treatment and prevention program in sport related injuries of lower limb in the young athlete – Dr. D.L Marshall
0940 – 1020 Panel Discussion: Anterior cruciate ligament tear surgical options – How I do it: Indication, decision making and surgical technique – Dr. M. Yaniv, Dr. M.T. Busch, Dr. T.J. Ganley, Dr. F. Chotel
1020 – 1040 Management of tibial spine fractures – Dr. F. Chotel
1040-1100 Coffee break

Morning Sessions 2: Knee and Hip
Session Chair: Prof. Shmuel Dekel
1100 – 1120 Discoid meniscus – treatment rationale and protocol. – Dr. T.J. Ganley
1120 – 1140 Anterior knee pain in children and adolescents – Dr. M. Yaniv
1140 – 1200 Medial patello femoral ligament reconstruction in the immature knee – Dr. F. Chotel
1200 – 1215 Panel Discussion: Patellar instability in the skeletally immature patient – conservative and surgical approach to treatment – Dr. T. Becker, Dr. M.T. Busch, Dr. D.L. Marshall, Dr. F. Chotel,
Dr. T.J. Ganley
1215 – 1230 Knee O.C.D in the skeletally immature knee – Dr. T.J. Ganley
1230 – 1300 Hip arthroscopy in the pediatric patient. Indications and results – Dr. M.L. Murnaghan
1300-1345 Lunch break

Afternoon Sessions 1: Foot and Ankle
Session Chair: Prof. Moshe Salai
1345 – 1415 Instability of the ankle in the skeletally immature athlete – treatment options (conservative and operative) – Dr. M.T. Busch
1415 – 1430 Tendons instabilities of the ankle in adolescent athletes – Dr. M.T. Busch
1430 – 1445 Ankle O.C.D. in children and adolescents: Operative techniques for stable and unstable lesions. – Dr. M.T. Busch
1445 – 1500 Anterior and posterior impingement of the ankle – Dr. M.T. Busch
1500 – 1515 Ossicles around the foot – Dr .M.L. Murnaghan
1515-1540 Coffee break

Afternoon Sessions 2: Upper Extremity and Spine
Session Chair: Dr. Mark Lovenberg
1540 – 1600 Shoulder instability in adolescent athletes. – Dr. T.J. Ganley
1600 – 1620 Rotator cuff injures in adolescent athletes: Prevention and treatment guidelines – Dr. T.J. Ganley
1620 – 1640 Osteochondritis dissecans of the capitellum in adolescent athletes (pathogenesis, evaluation and treatment) – Dr. M.L. Murnaghan
1640 – 1700 Spondylolysis/lysthesis in the pediatric and adolescent athlete – Dr. D. Ovadia
Nutritional Aspects of the Young Athlete

Rakefet Arieli
R.D M.Sc IOC Certified
The Hadassah-Hebrew University Sports Medical Center

Adequate dietary intake is important to maintain health, growth, and maturation as well as to minimize injury and optimize sports performance. Children and adolescents have specific nutritional needs, and although the principles of sports nutrition are similar for children and adults, there are some important differences, particularly with respect to energy expenditure, fuel utilization, and thermoregulation during exercise. During this life stage, particularly in girls, there is an increased risk for inadequate dietary intake secondary to dieting to optimize physique. This increases the risk for energy deficiency. Chronic inadequate energy intake may result in short stature, delayed puberty, menstrual irregularities, poor bone health, and increased risk of injuries. Monitoring growth, body mass, and other anthropometric variables can help health professionals to assess if energy intake is adequate for a given young athlete to maintain growth, health, and performance. Possibly one of the greatest threats to energy intake is the practice of weight control in young athletes. If a reduction in body mass is required, it should be gradual and not more than 1.5% of body mass each week. Major differences in the dietary requirements of young athletes include: increased requirements for energy, protein, and probably carbohydrate compared with their non-athletic peers. Intakes of micronutrients may also be elevated, particularly iron and calcium support bone accretion.

Young athletes who perform prolonged or intense, intermittent exercise can present with dehydration, which may affect performance and health. The effects of nutritional supplementation in children and teens have yet to be explored for aspects of recovery after exercise and effect on immunologic and inflammatory stresses. Supplements, unless clinically indicated, are not recommended. There is limited research on the nutrition requirements of young athletes and a need for further study.


ACL Injuries in Youths:
Natural History & Treatment Options

Michael T. Busch, MD

ACL's in Kids
- What are the unique features?
- What are the options?
- How to decide?

Knee Ligaments in Children
- Anatomy
- Can occur with femur fractures
- Physi is not always the weak link
- Conventional tunnels cross the physi

Mechanism:
- Open field cutting injury without contact
- Contact injury
- Hyper-extension
- Hyper-flexion

Colaterals?
Valgus Injury / Laxity

Concurrent Meniscal Injuries
- Many repairable
- Not exactly clear how kids differ
- Generally: "be more aggressive"
ACL tears in Immature kids?
- What is the natural history?
- What are our options?

Case Examples - #1
17 y/o male BKB player - 90Kg
- What are the options?
- How do we analyze growth remaining?
- Any special considerations for this "kid"?

Growth Remaining - Boys

Case Examples - #1
17 y/o male BKB player - 90Kg
- No growth remaining
- Unfavorable natural history
- Nothing to gain by waiting
- "Adult" treatment

Case Example #2
13 y/o female; basketball - 50Kg
- We see the physeal, but do we need to worry?
- Would have to know more about skeletal maturity!
  - Tanner staging
  - Other alternatives?

Xray vs. MRI
- MRI may show physeal cartilage after the radiographs show closure
- Look for closure of the upper central tibia
Growth Remaining - Girls

Bone Age
Most often they match, but...

Bone Age
Some kids mature long before others - Menstrual history may be a clue

Recommendation: Any doubt, get a bone age

Age Groups

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mature</td>
<td>14+</td>
<td>10+</td>
</tr>
<tr>
<td>Nearly Mature</td>
<td>12-13</td>
<td>14-15</td>
</tr>
<tr>
<td>Immature</td>
<td>10-11</td>
<td>12-13</td>
</tr>
<tr>
<td>Very Immature</td>
<td>&lt;10</td>
<td>&lt;12</td>
</tr>
</tbody>
</table>

Case Example #2

Case Example #3
12 y/o female: gymnast - 40Kg
- Can we safely reconstruct her now?
- Is it safer to wait?
- If not, what can be done be done to reduce the risk of growth disturbance?

Nearly Mature Knee
13 y/o female: basketball - 50Kg
- Still dealer’s choice...
- Keep size of the patient in mind
- Virtually no risk of growth complication
- Don’t introduce unnecessary anxiety
- Beware of what you read

My advice
**Case Example #3**

**Age Groups**

<table>
<thead>
<tr>
<th></th>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mature</td>
<td>14+</td>
<td>16+</td>
</tr>
<tr>
<td>Nearly Mature</td>
<td>12-13</td>
<td>14-15</td>
</tr>
<tr>
<td>Immature</td>
<td>10-11</td>
<td>12-13</td>
</tr>
<tr>
<td>Very immature</td>
<td>&lt;10</td>
<td>&lt;12</td>
</tr>
</tbody>
</table>

**Treatment Options for the Growing Knee**

- Nothing
- Brace
- Acute reconstruction

---

**Nothing**

- "Do no Harm"
- Avoids some "unnecessary" surgery

**Good News**

**Natural history**
- 90% re-injury
- Meniscal injury
- Further laxity
- Osteochondral injury

**Bad News**

---

**Bracing**

- Often successful in the "very young"...at least for a while

**Good News**

- Not universally protective
- Poor torsion control
- Usually custom needed

**Bad News**

---

**Acute Reconstruction**

- Significantly reduces re-injury / further injury
- Very low risk to growth – if done correctly
- Allows return to sports...

**Good News**

**Bad News**

- Risk of growth disturbance
- Few might have avoided surgery

---

**"Natural History" Data**

**McCarroll, AJSM 1988**

- 18 treated "conservatively"
  - 9/16 gave up sports
  - 7/16 participated, but w/o instability
- 10 re-injuries, pain, effusions
- "70% re-injury rate if active"
- 22/24 surgical rx returned to sports without problems
- Possibly irreversible damage at a very young age
What if you “must” stabilize the immature knee?

Basic Science Evidence: Physeal Drilling

Basic Science Evidence

- No problem is seen in injuries of 4-5%.
- Growth retardation occurs in drill injuries destroying 7-9% of the distal femoral physis.

Basic Science Evidence

12 yo girl MRI:
- 8mm drill holes destroy 3-4% of the physis
- Should be below the limits for growth disturbance
- Rabbit data...

Basic Science Conclusions

- Filling the hole is good
- Smaller holes are safer
- 6-8 mm looks about right
Summary

**Bottom Line: Immature Knee**

- Fixable problem with overt risks - that can be managed

**VS**

- Potentially unsolvable problem with more hidden risks

**Immature Knee**

12 y/o female; gymnast - 40Kg

- Must evaluate maturity
  - Bone age
  - Delayed maturation in very lean athletes
- Educate the family re: risks and alternatives
- Soft tissue graft
  - Autograft hamstring
  - Allograft posterior tibial tendon
- Physeal sparing fixation

---

**Case Example #4**

10 y/o boy; all sports - 40Kg

Complete tear of the ACL, but no meniscal injury (yet)

---

**Age Groups**

<table>
<thead>
<tr>
<th></th>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mature</td>
<td>14+</td>
<td>16+</td>
</tr>
<tr>
<td>Nearly Mature</td>
<td>12-13</td>
<td>14-15</td>
</tr>
<tr>
<td>Immature</td>
<td>10-11</td>
<td>12-13</td>
</tr>
<tr>
<td>Very Immature</td>
<td>&lt;10</td>
<td>&lt;12</td>
</tr>
</tbody>
</table>

---

**Very Immature Knees**

*Natural history*

- Probably not good

*Bracing*

- Small size = better brace success??

*Transphyseal reconstruction*

- Almost no data on trans-physeal holes
- Tethering

---

**Basic Science Evidence**

- Puppy model: tethering in very young

[Edwards, TB JBJS 2001]
Basic Science Conclusions

- Filling the hole is good
- Smaller holes are safer
- 6-8 mm looks about right
- Consider the tethering effect
  - Especially in these "young pups..."

Very Immature Knee

*Strongly consider non-op rx.*
- Brace
- PT
- Activity restrictions
  - Football
  - Basketball
  - Soccer
  - Llense
- Follow-up Q 6 months

Indications for Surgery

10 y/o boy, all sports - 40Kg
- Reparable meniscus
- Failed non-op treatment
  - Re-injury
  - Non-compliance
- Family choice

Final Case Example

14 y/o boy, wrestler - 55Kg
- Bucket handle medial meniscus tear / ACL
- Partial (subtotal) meniscectomy; no ACL because “it’s too risky”
- 9 months later re-injury: irreparable injury of the lateral meniscus
- Physis still open, so now what?

No good solution!

Summary

- Need to fully evaluate age
- Know all the options
- Risk: Benefit
- Even in the growing knee, non-operative treatment may not be so "conservative"

Thank-you!
Foot and Ankle Problems of Young Athletes

Michael T. Busch, M.D.

No financial disclosures

Ankle Problems of Young Athletes

Overview
- Ankle joint instability
- Tendon instability (peroneals)
- OLT's
- Impingement
  - Anterior
  - Anterolateral
  - Posterior
- Ossicles (Dr. Mumaghah)

Ankle Sprain & Instability

History & Physical

Pertinent Ligaments

Incidence and Frequency

Highlights
- 27,000/day in the US
- Most common sports injury
- Peak incidence 15-19 y/o
- Severe grade in 1/3 of all HS basketball players over 4 years
Treatment Options
✦ Non-operative Care
  • No treatment
  • PT, brace, etc.
✦ Primary Repair
✦ Reconstruction
  • Pinning
  • Augmentation
  • Shrinkage

Ankle Sprains
✦ Extremely Common
✦ Frequency in Basketball: 70%
✦ Severe Grade: 32%
✦ Recurrence: 80%
✦ Rehab / Prevention

Treatment
✦ Pediatric / adolescent specific programs
✦ Pain management
✦ Range of motion
✦ Strength
✦ Proprioception
✦ Return to sport

Pain Management
✦ RICE technique
  ➤ Rest
  ➤ Ice
  ➤ Compression
  ➤ Elevation
✦ Modalities
  ➤ Ice
  ➤ Electrical stimulation
  ➤ Taping/bracing

Range of Motion
Active, Passive, Active Assisted

Strength
✦ Isometric
✦ Isotonic
  ➤ Concentric
  ➤ Eccentric
✦ Isokinetic
**Proprioception**
- Affected by injury
- Start in early phases
- Advanced throughout

**Return to Sport**
- More than exercises
- Sport specific skills
- Vary the challenges
- Protect
  - Taping
  - Bracing
- Prevent re-injury!

**Who Needs How Much?**

**Primary Repair?**
- Highlights
  - Comprehensive meta analysis
  - No advantage to early surgery
  - Most do well
  - Rehab > no rx
  - Good outcomes with reconstructions
  - Beware of concurrent subtalar instability


**Plication = Broström**
- Gould modification

Gould N. Foot Ankle 1980
Reconstruction / Plication

Indications

- Anterolateral Ankle Instability
  - Refractory
  - ATFL ± CFL laxity

Relative Contraindications

- Failed plication
- Known tissue deficit
- Connective tissue disorder
  - Ehlers-Danlos
  - Marfan

Other Considerations

- Peroneal tendon instability
- OLT’s
  - Osteochondral Lesions of the Talus
  - Posteromedial
  - Anterolateral
- "High ankle sprain"
- Subtalar instability

Look for Subtalar Instability

- Hard to diagnosis & document
- Evaluate at surgery

Surgery for Subtalar Instability

- Plication
- Augmentation
ATFL Plication

CFL Strategy

CF Plication

Test Both Directions

12a

12b

Gould Modification

Post-op Plan

- Cast / splint
  - Eversion / neutral
  - 2 weeks non-weight bearing
- Cam walker or air stirrup
  - 2-4 weeks
  - Weight bearing as tolerated
- Physical Therapy
- Return to Sports: 3-4 months
Augmentation Procedures

“Anatomic” Reconstruction

Electrothermal Shrinkage

Electrothermal Shrinkage

Summary

Summary

- Very common injury
- Most non-operative
  - PT does make a difference
    » More severe
    » More athletic
- Primary repair rarely indicated

- Several early/small reports
- May go the way of heat in the shoulder
  - Need time to clarify the complications
  - Probably some indications
  - Hard to delineate the role/indications
- Keep an open mind

- Brostrom for most
  - Good tissue
  - Avoids physes
- Augmentation for tissue deficit
- Arthroscopy?
Questions?

Peroneal Tendon Instability

History & Physical
- Usually DF ankle with eversion of the hindfoot
- Acute presentation similar to lateral ankle sprain
- Chronic presentation visual and palpatory

Anatomic Variants
- Peroneus Quartus
  - 102 cadaver dissections
  - 80 MRI
  - 6.6% incidence
- Common origin: Peroneus Brevis
- Common insertion: Retromalleolar Eminence
- Can contribute to peroneal instability

Zambrani, I Bone Joint Surg Br, 2005

Treatment Options
- Non-operative Care
  - Recognize the acute injury
  - Immobilize
  - Therapy
- Repair
- Reconstruction

Anatomical Repair

Oliva, F Bull Hosp Joint Dis '06
**Anatomical Repair**

- Can add a bony procedure to deepen the peroneal groove if mature.

**Pediatric Reconstruction**

- Modified Chrisman-Snook
- Split peroneus brevis
- Through the epiphysis
- Into the calcaneus

*Forman & Michell, Foot & Ankle 2000*

---

**Summary**

- Primarily a clinical diagnosis
  - Immediate treatment may help
  - Consider other problems
- Repair the superior peroneal retinaculum
  - Much like a Bankart
  - Consider small suture anchors
- May need to deepen the groove
  - Consider the physis
  - Preserve the smooth surface

**Questions?**

---

**Osteochondral Lesions of the Talus - OLT’s**

**Classification:**

- OLT’s

*Berndt & Hardy / JBJS ’59*
Location & Etiology

Bilateral = 10%

- Medial
  - 64% trauma
  - Deeper
  - Posterior
  - Plantarflex, inversion, ER

- Lateral
  - 100% trauma
  - Shallow/water
  - Anterior
  - Dorsiflex, inversion, IR

Central Lesions

- Not much written
- Etiology?
- Bilateral & Painful

Intact Surface Cartilage - Drill

Drilling for Intact Surface Cartilage

Micro Vector Guide (Dyonics S&N)

Percutaneous Autografting

Disrupted Surface - debride
Summary

OLT’s of three regions
- Seem to differ in nature
- Conservative treatment for few
- Strategy determined by the surface cartilage
- Strongly consider posterior portals

Questions?

Anterolateral Ankle Impingement

- Treatment:
  - Brace
  - Ice
  - NSAIDs
  - Cast
  - Inject
  - Arthroscopy
    » Accessory fascicle anterior
distal talo-fib ligament

Anterolateral Impingement

Superficial Peroneal Nerve - Intermediate Branch
Accessory Fascicle

Anterolateral Ankle Impingement

Look for a “Ferkle lesion”

Anterolateral Ankle Impingement
- Pitfall: underestimating instability

Meniscoid Lesion

Highlights
- Fibrotic tissue
- Tib-fib articulation
- Repetitive trauma
- Pain with squeezing the mortise

Meniscoid Lesion
**Anterolateral Lesions**

Intact surface - drill from below

**Posterior Ankle Impingement**

*Anatomy*

A) Post tib-fib  
B) Transverse tib-fib  
C) Post talofib  
D) Os trigonum  
E) “Tibial slip”

**Posterior Ankle Impingement**

*Anatomy*

A) Post tib-fib  
B) Transverse tib-fib  
C) Post talofib  
D) Os trigonum  
E) “Tibial slip”

**Posterior Ankle Impingement**

*DDx*

- Chronic synovitis  
- Adhesions  
- Extension of lateral impingement  
- Hypertrophied transverse ligament  
- “Meniscus of the ankle”  
- “Labrum” of the posterior ankle  
- Os trigonum

**Os Trigonum**

- Posterior talus  
- Usually an incidental finding  
  - Pain  
  - Snapping/popping  
- Occasionally symptomatic after trauma or repetitive use  
- Dance & marshal arts

[Images and diagrams related to the text]
Os Trigonum “Syndrome”

Treatment
- Conservative:
  - Rest & immobilization
  - NSAIDs
  - Steroid injection
  - Time & activity modifications
- Refractory cases → surgery
  - open vs. arthroscopic

Surgical Options

**Open**
- Slower rehab/return to sport
- Wound healing complications
- Neurovascular injury
- Scar

**Arthroscopic**
- Can be hard to visualize
- Technical challenges
- Neurovascular injury

Os Trigonum: Arthroscopic resection

Technique Tips
- Set up like a knee
- Exanguinate before prep
- Foot in lap
- 2.9 mm scope

Distraction

Rarely needed
- Ligament laxity in kids
- Joint vs. recesses
- Complications - fractures
- Open physes

Distraction

Highlights
- Ligament laxity in kids
- Joint vs. recesses
- Complications - fractures
- Open physes
- Strap systems

...when needed
Post-op

- Ace, Cryocuff®, Ropivacaine
- WBAT
- PT
  - Start ROM & PRE's @ 2-3 days
  - 2-3x/wk for 4-8 weeks
  - Agility thru SSAP
  - Sports when functional

Project Acknowledgements

- Swaz Sinha, M.D.
- Joseph Alderete, M.D.
- Timothy Gancy, Ph.D.
- JA Ogden, M.D.

Study Design

- Retrospective consecutive case series
- 2005-2009
- Single surgeon
- IRB approved

Study Design

Inclusion:
- XRAY/MRI confirmed symptomatic os
- Prior non-operative treatment

Exclusion:
- Co-existing ankle pathology
Study Group

- 19 ankles (16 patients)
- 15 female, 1 male
- Average Age: 15.8 yrs
  - Range 13-21
- Average Follow-up:
  - Range 1-15 months

Os T Results

16 Patients / 19 Ankles

- All returned to their sport
  - Average 9.6 weeks
  - Range 4-16 weeks
- 1 complication
  - Portal-site post-operative infection
- No N/V injuries
- No repeat procedures
- All relieved of pre-op sx’s

Results

- All 16 patients returned to their sport
  - Average 9.6 weeks
  - Range 4-16 weeks
- 1 complication
  - Portal-site post-operative infection
- No N/V injuries
- No repeat procedures
- All relieved of pre-op sx’s

Conclusions

- Coaxial posterior ankle portals effective for access to the os trigonum
- Early return to sport
- Low complication rate
- High satisfaction

Summary

- Anterolateral Impingement
  - Common after all sorts of injuries
  - Must get better with time
  - Clinical diagnosis
  - Small procedure
  - Consider other explanations

Summary

- Anterior Impingement
  - Primarily numbness
  - “Landing short” = forced dorsiflexion
  - Soft tissue impingement
  - Look for bony lesion like a cam or pincer of the hip
Summary
- Posterior Impingement
  - Repetitive plantarflexion
  - Growing occurrence
  - MRI may help
  - Conservative care first
  - Consider arthroscopic resection

Conclusions
- Ankle in young athletes:
  - Common
  - Full gamut of problems
  - Full gamut of solutions

Questions?
Medial patello-femoral ligament reconstruction in children

Pr. Franck Chotel

Medial patello-femoral ligament (MPFL) is primary restraint for lateralization of the patella; it contributes up to 80% of lateral restraining forces. Since year 2000, MPFL reconstruction became very popular in knee adult surgeons but few publications report pediatric application.

The author reports experience with MPFL reconstruction in episodic patella instability but also habitual or permanent patellar dislocations.

Permanent patellar dislocation is a rare congenital disease often part of associated conditions or combined with others patella abnormalities. Because of short quadriceps, flexion is limited if the patella is locked manually in the trochlea. Double bundle MPFL reconstruction with a modified Deie procedure is performed associated with lateral retinaculum release, extraperiosteal quadriceps release according to Judet, and soft rod technique medialization of the anterior tibial insertion. Postoperative postures are fundamental with alternance of flexion and extension splints.

Habitual patellar dislocation occurs during each flexion. Diagnosis is made between 5 and 8 years old, and « à la carte » surgery is indicated with systematic MPFL reconstruction.

Episodic patella instability is a more common and less complex situation as anatomic abnormalities are less severe. It involves preadolescents and adolescents. Modulation or adaptation of activities is observed in young patients who mainly complain of instability (rather than pain). For mature patients, MPFL reconstruction was performed according to Fithian and associated with bone distal and medial transfer of the anterior tuberosity for patella alta, and sometime trochleoplasty. For immature patients, Deie or modified Deie procedure was performed with hamstring tendons but no Insall plasty was performed any more. Soft rod transfer of the anterior tuberosity, and sometime lateral retinaculum release are performed in a « à la carte » surgery.

After follow-up, no recurrent dislocation was reported and a firm endpoint to lateral patellar translation was noticed for all patients. Apprehension test was negative for all. A significative decrease of patella tilt on CT scans was observed postoperatively compared to preoperatively.

MPFL reconstruction seems to be an effective procedure in children and adolescents. It allows a good subjective and objective control of instability. Patellar tilt is significantly improved by MPFL reconstruction. Biggest series with longer follow-up are required to confirm this study conclusion.

Few references:
spondylolysis & spondylolisthesis

Ovadia Dror, M.D.
Orthopaedic Surgeon
Head of Paediatric Spine Service
Department of Paediatric Orthopaedics
Dana Children's Hospital

Introduction

- Spondylolysis and spondylolisthesis are common causes of LBP in children and adolescents.
- *Spondylolysis* is the term used to describe an anatomic defect of the pars interarticularis without displacement of the vertebral body.
- *Spondylolisthesis* describes the forward translation of one vertebra relative to the next caudal vertebral segment.
  - Spondylolysis is symptomatic in only 10-25% of patients
  - Spondylolisthesis occurs in about 30-50% of cases
  - Incidence of spondylolysis: 3-7% of the general population
    - 6-7% in white male
    - 2.8% in black men
    - 25-46% in Eskimos
  - high incidence certain athletes
  - males to females ratio 2:1

Etiology

- Multifactorial
- Hereditary factors - prevalence in first-degree relatives 25-30% (up to 69%)
- Congential predisposition
- Mechanical factors - Upright posture (lumbar lordosis) and gravity (no reported cases in nonambulators or in other primates)
  - Repetitive hyperextension and rotational loads

Mechanical factors - cont.

  - A retrospective analysis based on lumbar spine radiographs of 4243 young male and female athletes with symptoms relating to the lumbar spine.
  - 590 athletes (13.9%) had a radiological diagnosis of spondylolysis concomitant spondylolisthesis was found in 280 of these (6.6%).
Table 1 - The prevalence of spondylolysis in different sports and athletic populations presenting with low back pain

<table>
<thead>
<tr>
<th>Sport</th>
<th>No. Athletes</th>
<th>Spondylolysis</th>
<th>% with Spondylolysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diving</td>
<td>57</td>
<td>23</td>
<td>40.35</td>
</tr>
<tr>
<td>Wrestling</td>
<td>80</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Weight Lifting</td>
<td>112</td>
<td>25</td>
<td>22.32</td>
</tr>
<tr>
<td>Modern Pentathlon and Triathlon</td>
<td>54</td>
<td>11</td>
<td>20.37</td>
</tr>
<tr>
<td>Track/field</td>
<td>353</td>
<td>61</td>
<td>17.28</td>
</tr>
<tr>
<td>Sailing</td>
<td>128</td>
<td>22</td>
<td>17.18</td>
</tr>
<tr>
<td>Gymnastics</td>
<td>673</td>
<td>112</td>
<td>16.64</td>
</tr>
<tr>
<td>Football</td>
<td>400</td>
<td>65</td>
<td>16.25</td>
</tr>
<tr>
<td>Skiing</td>
<td>154</td>
<td>25</td>
<td>16.23</td>
</tr>
<tr>
<td>Judo and martial arts</td>
<td>64</td>
<td>10</td>
<td>15.62</td>
</tr>
<tr>
<td>Bobsleighing</td>
<td>36</td>
<td>5</td>
<td>13.88</td>
</tr>
<tr>
<td>Cycling</td>
<td>95</td>
<td>13</td>
<td>13.68</td>
</tr>
<tr>
<td>Fencing</td>
<td>143</td>
<td>19</td>
<td>13.28</td>
</tr>
<tr>
<td>Tennis</td>
<td>306</td>
<td>36</td>
<td>11.76</td>
</tr>
<tr>
<td>Canoeing</td>
<td>69</td>
<td>8</td>
<td>11.59</td>
</tr>
<tr>
<td>Water skiing</td>
<td>18</td>
<td>2</td>
<td>11.11</td>
</tr>
<tr>
<td>Boxing</td>
<td>27</td>
<td>3</td>
<td>11.11</td>
</tr>
<tr>
<td>Water polo, swimming, syncro.</td>
<td>307</td>
<td>34</td>
<td>11.07</td>
</tr>
<tr>
<td>Rugby</td>
<td>65</td>
<td>7</td>
<td>10.76</td>
</tr>
<tr>
<td>Volleyball</td>
<td>150</td>
<td>16</td>
<td>10.66</td>
</tr>
<tr>
<td>Shooting</td>
<td>76</td>
<td>8</td>
<td>10.52</td>
</tr>
<tr>
<td>Basketball</td>
<td>174</td>
<td>17</td>
<td>9.77</td>
</tr>
<tr>
<td>Luge</td>
<td>25</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Rowing</td>
<td>246</td>
<td>19</td>
<td>7.72</td>
</tr>
<tr>
<td>Ice and field hockey</td>
<td>170</td>
<td>13</td>
<td>7.64</td>
</tr>
<tr>
<td>Handball</td>
<td>42</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>Ice skating</td>
<td>42</td>
<td>3</td>
<td>7.14</td>
</tr>
</tbody>
</table>
Classification

- **Neugebauer 1880** - congenital and acquired types
- **Capener 1931** - pars fracture and abnormal spine anatomy
- **Wiltse and Newman 1976** - congenital / dysplastic
  - isthmic / lytic
  - degenerative
  - traumatic
  - pathological
- **Marchetti and Bartolozzi 1997** - developmental
  - acquired - traumatic
  - post surgery
  - pathologic
  - degenerative

**Wiltse-Newman Type I (Dysplastic type)**

- Congenital abnormalities of the lumbosacral articulation (maloriented or hypoplastic facets, sacral deficiency)
- Pars may remain intact, develop poorly, elongate, or lyse
- Most cases are associated with spina bifida occulta
- Less common - comprising ~15% of cases
- Higher risk of progression and neurological injury

**Wiltse-Newman Type II (Isthmic type)**

- Most common type, results from defects of the pars interarticularis
- Aprox. 85% of isthmic lesions occur at L5 (L4 ~10%, L3 ~ 3%)
  - **Type IIA** - The most common subtype
    - Fatigue failure of the pars from repetitive loading
    - Resulting in a complete radiolucent defect
  - **Type IIB** - An elongated pars secondary to repeated microfractures that heal
  - **Type IIC** - A pars fracture that results from an acute injury

**Clinical presentation**

- Most cases present during the first and second decades of life (dysplastic type usually present earlier)
- Usually insidious onset of low back pain that is aggravated by extension activities, may radiate to the buttocks and posterior thigh
- May present with deformity and gait abnormalities without pain
- A history of night pain is not typical Physical examination and findings
- The physical examination frequently yields minimal findings

**Back**

- Tenderness to palpation in the low back
- Pain with hyperextension of the spine
- Palpable step off at the lumbosacral junction in high grade listhesis
  - “Heart-shaped” buttocks when viewed from back
- Scoliosis is present in about 13% of patients who have spondylosis and in 20% of patients with symptomatic spondylolisthesis
Tight Hamstrings

- Due to lumbosacral instability and vertical rotation of the sacrum
- Positive in 80% of symptomatic patients, may be the only finding
- May cause peculiar gait, shortened stride length, tiptoe walking
- The child may prefer to jog or run rather than walk
- Lumbar flexion and extension are often limited
- SLR may be limited

Typical clinical appearance of a 11 year old girl

- Hips and knees flexion
- Vertical sacrum position
- Lumbosacral kyphosis
- Compensatory thoracic lordosis
- The spine is out of balance and scoliosis develops

SPECT bone scan

- The most effective method for detecting acute spondylolysis (when plain x-rays are normal and the patient history and physical examination are suggestive of the diagnosis)
- Increased radionuclide uptake in an intact pars, lamina, or pedicle is consistent with a stress reaction

CT scan

Thin-section CT is the best modality for defining the bony anatomy of spondylolysis and spondylolisthesis

MRI

- Indicated when neurologic symptoms and signs are present
- The role of MRI as a primary diagnostic tool in patients with symptomatic spondylolysis is not well defined.

Meyerding classification

Quantifies the amount of forward translation based on the standing lateral radiograph

Slip angle

- The degree of lumbosacral kyphosis (normally <00)
- Kyphotic slip angle is associated with greater risk of slip progression

Sacral inclination

- Normally 300
- High sacral inclination is associated with greater risk of slip progression

Pelvic incidence

- High pelvic incidence implies greater lumbar lordosis and thus increased shear forces at the lumbosacral junction
- Mean pelvic incidence in normal children is 47°, and in adults 57°
- High pelvic incidence correlates with high Meyerding grades of isthmic spondylolisthesis and is a bad prognostic sign
**Prognosis and natural history**

- Most children with spondylolysis will remain asymptomatic.
- The age at presentation is probably the most important in determining the appropriate treatment.
- Significant progression is uncommon after maturity in mild deformities.
- Isthmic lesions have healing capacity particularly in unilateral lesion pattern and when braced early (1 month or less after onset of symptoms).
- Patients with unilateral L5 pars defects and low-grade slips followed a clinical course similar to the general population.

(Beutler et al. Spine 2003)

**Risk factors of progression**

- Repeated episodes of pain
- Hamstrings tightness
- Postural deformity or gait disturbance
- Dysplastic lesions (32% progression vs. < 4% of isthmic type)
- Diagnosis before adolescent growth spurt
- Female sex
- High pelvic incidence
- High grade slip >50% (Meyerding III-IV)
- Radiographic findings of dome shaped vertical sacrum, trapezoidal L5, kyphotic slip angle

**Treatment**

**None surgical**

- Early treatment with brace immobilization has achieved results superior to those of activity restriction alone.
- Full-time immobilization in a TLSO with or w/o thigh extension, for a period of 16-12 weeks is indicated.
- Immobilization may be discontinued once lumbar extension and rotation without pain or bony healing in follow-up CT (?)
- Stop immobilization > physiotherapy > resume activity

**Indications for Surgical Management**

- Failure of conservative treatment of 6-12 months
- Documented slip progression
- Neurological deficit
- Symptomatic high-grade slip

**Surgical options for spondylolysis and low-grade listhesis**

- In situ posterolateral fusion
- Pars repair (L4 & above)
- Laminectomy as an isolated technique is contraindicated
Surgical options for high-grade spondylolisthesis

- In situ posterolateral fusion from L4 to S1 remains the preferred method of treatment
- Instrumented reduction and fusion
- Wide decompression of nerve roots combined with instrumented partial reduction
- The ideal method of treatment of high-grade spondylolisthesis is a subject of some controversy

Advantages of reduction

- Better sagittal balance and cosmesis in severe deformities
- Improvement of spinal stenosis and potentially improving neurological symptoms
- Restoration of more nearly normal lumbosacral alignment diminishes the shear forces across the fusion mass
- The addition of spinal instrumentation allows for more rapid mobilization and rehabilitation, and maintains reduction

Reduction of spondylolisthesis and fusion

- Preoperative halo-femoral traction with pelvic suspension
- Gradual intraoperative reduction with instrumentation
- Postoperative reduction with cast molding in hyperextension
- Isolated radiculopathy of L5 has been reported up to 30%
- Petraco et al. demonstrated that 75% of the total nerve strain occurs during the second half of reduction (spine 1996)
- Lenke and Bridwell advocate only partial reduction with decompression and posterolateral fusion for high-grade spondylolisthesis

Intraoperative correction

- Reduction of the posterior pelvic tilt
- Diminished implant volume
  - Leave more space for bone graft
    - Intracral rods (Jackson technique)
    - cage

Complications

Pseudoarthrosis

- The most common complication after surgical treatment of spondylolisthesis (up to 45% in high grade deformities)
- The highest rates are seen after in situ fusion in patients with severe residual slip angles who are not immobilized
- For asymptomatic minor progressive slippage or radiographic pseudarthrosis only, no treatment is necessary
Neurological Injury

- Iatrogenic neurological injury is a rare after in situ fusion, but has been reported up to 30% after reduction of high grade slips
- The best strategy is prevention by use of real-time neurophysiologic monitoring, wake-up test, wide root decompression before reduction, and controlled partial reduction
- Isolated radiculopathy of L5 is the most common complication

Summary

- Spondylolysis and spondylolisthesis are common causes of back pain in the child or adolescent
- The incidence is particularly high in athletes who participate in sports that place excessive stress on the lumbar spine
- Most patients may be successfully treated by nonsurgical methods with expected return to full activity
- When pain persists, progressive vertebral displacement increases, or in the presence of progressive neurologic deficits, surgical intervention is appropriate
Young athletes with disability will be referred in this presentation according to UN criteria as young people up to 25 years of age. They may include those with congenital as well as those with acquired origins of their disability. Research has provided some evidence for differences in the psychological attributes among these subtypes of participants. Nevertheless, individually tailored considerations of personal, environmental and task specific constraints for the evolution of young athletes with disability are needed. This presentation will address the International Classification of Function, Disability and Health (ICF: WHO, 2001) and the Physical Activity in Disability (PAD: van der Ploeg, 2004) models as a general framework and the Systematic Ecological Modification Approach (SEMA: Hutzler, 2008) as specific approach for adapting sport techniques, training methods, and organizational promotion strategies for young athletes with disability. Individual cases will be demonstrated and research findings summarized in order to acknowledge precautions and recommendations for practitioners, while professionally managing young athletes with disability.
Managing Osteochondritis Dissecans of the Knee

Theodore J. Ganley, M.D.
Director of Sports Medicine,
The Children’s Hospital of Philadelphia
Associate Professor of Orthopaedic Surgery,
The University of Pennsylvania School of Medicine

Overview of Goals/Objectives
Understand:
- The Clinical Presentation
- The Decision Making Algorithm
- Surgical Options

Background/Key facts
Idiopathic etiology
Disorder of the subchondral bone
Secondarily affects overlying articular cartilage
Can lead to cartilage separation and fragmentation
Repetitive microtrauma can contribute to focal ischemia and alteration of growth
Location:
  - Lateral aspect of the MFC most common site, up to 75%
  - Inferior-central lateral 15-20% / Patellar 5-10% / Trochlea <1%

Clinical Presentation
Stable lesions
  - Patients may report aching and activity-related knee pain
    - Pain for classic lesions primarily localized at anterior aspect
Unstable lesions
  - Swelling/stiffness
  - Mechanical symptoms
Symptoms overlap with those from other causes
  + Wilson’s sign - Lacks Sensitivity

Diagnostic Studies
Plain Radiographs
  - Evaluate: maturity, bony injury, lesion age
    - AP/Lateral, Notch – posterior femoral condyles
    - Skyline/Merchant – Patella/Trochlea
    - MRI
Lesion size
  - Cartilage and subchondral bone
  - High signal strength beneath the fragment – bone edema, articular breach
Bone Scans
  - Not widely adopted
Healing Potential – Operative Treatment Rationale

➤ Retrospective evaluation of 27 lesions in 24 patients  (Pill, Ganley et al JPO 2003)
Patients closer to skeletal maturity and those with MRI signs of instability – less likely to heal

➤ Nonoperatively treated skeletally immature patients  (Wall et al. JBJS 2008)
31/47 showed radiographic sign of progressive healing at 6 months
Larger lesions and those causing mechanical symptoms – less likely to heal

➤ Nonoperative vs. Operative treatment of skeletally immature patients
A Stochastic Decision Tree Model and Cost Analysis  (Bahlaat, Lawrence, Ganley 2010)

Operative indications
Persistent symptomatic juvenile lesions
(failed conservative trial(s))
Predicted physeal closure within 6-12mo
Symptomatic loose bodies
Fragment detachment / non-union
Operative Management:

Treatment of stable lesions

Goals

- Enhancement of local blood supply
- Protected weight bearing

Techniques

- Antegrade arthroscopic drilling
  - 0.62mm smooth K-wires
  - Perpendicular to joint surface
  - Holes several mm apart

- Retrograde
  - 0.62mm smooth K-wires
  - C-arm visualization

OCD Lesion Intact
Stable

OCD Lesion Hinged
Unstable
Operative Management:

**Treatment of Stable lesions**

- **Transarticular Drilling**
  30 knees Drilled after non op tx failed – All achieved healing @ 4.4 months
  (Kocher 2001)

- **Epiphyseal Drilling**
  16 knees, mean age 12 years, mean follow up 21 months
  12 knees had excellent outcomes w/ full return to activity
  1 knee had fair results, 3 knees lost to follow up
  Arthroscopic extraarticular drilling is an effective treatment
  (Donaldson 2008)

  20 OCD lesions in 12 skeletally immature patients
  Mean age 12 years, mean follow up 2.7 years
  Lysholm score improved from 72.3 to 95.8
  19 lesions healed @ 4.4 months on X-ray and 7.6 months on MRI
  (Adachi 2009)

- **Drilling from the intercondylar bare area**
  16 Knee lesions in 12 patients, failed non-op tx, then drilling, mean f/u - 16 months
  All lesions healed after drilling / Lysholm score improved from 70.4 to 97.8
  Average time of healing 4 months by X-ray and 7 months on MRI
  (Kawasaki 2003)

- **Arthroscopic Fixation**
  12 knees w/ stable lesions, 14.8 years, 32.4 months follow up
  Arthroscopic fixation of the fragments using polylactide bioabsorbable pins
  All returned to sport

**Treatment of Massive / Atypical potentially Unstable lesions**

- **Epiphyseal Drilling with supplemental grafting**
  With or without the use of intraoperative 3D CT scanning
  (Ganley 2010)

**Treatment of unstable lesions – partially detached**

Fixation +/- graft
Metal implant (pin or screw)
Bio-absorbables
  - **Pla** bioabsorbable pins
    (Din 2006)
    11 patients/Ages 12-16/ 32 mo fu
    Union noted on all MRIs
    1 case of early synovitis
  - **Pga** bioabsorbable pins
    (Weiler 1996)
    40% degrade w/in 6 mos
    Sheep model
    Foreign tissue reaction/lytic lesions
  - Bone Sticks
    (Navarro 2002)
    11 patients/ Ages 11-20/ 48 mo mean fu
90.9% Satisfactory, 1 Houghston poor
Synovitis/effusions – arthroscopy
Lesion integration
Return to competitive sports

Bioabsorbable Implants for Unstable Lesions
24 patients, mean age 14.4 years, mean follow up 39.6 months
At 19.2 months, plain films,
Complete healing in 13 pts/interval healing in 9 pts, no change in 1 pt
Loose bodies with no interval healing in 1 patient
Interval healing was present in 16/17 MRIs
All 24 patients had good-to-excellent outcomes
(Tabaddor 2010)

Cancellous screws (Herbert)\(^2^4\)
(Makino 2005)
14 patients/ Ages 12-35/ 50 mo mean fu / MFC/LFC
2\(^{nd}\) Look Arthroscopy / MRI/ IKDC
14-15 Stable fragment
Various methods\(^2^5\)
(Kocher 2007)
24 patients/ Ages 11-16/ 51 mo mean fu
9 fissured, 11 partially attached, 6 detached
Screws – cancellous and pitch/ absorbable tacks and pins
22 of 26 healed, (6 of 6 detached)
No differences in location, fixation or lesion grade in healing

Osteochondral autograft\(^2^6^-^2^9\)
Techniques
4.5 mm diameter plug at center of lesion / Additional plugs around periphery
Graft harvest from femoral trochlea
Stay perpendicular / Check depth / Minimize impaction on cartilage

IKDC Scores\(^2^7^-^2^9\)
Preop- 5 nearly normal / 10 abnormal / 7 severely abnormal
Postop - 6 mo. 17 normal, 1 nearly normal, 1 abnormal, 0 severely abnormal
18 mo. - 18 normal, 2 nearly normal, 0 abnormal, 0 severely abnormal

Advantages
Creates vascular access channel
Biologic bridge between cartilage and bone
Secures the lesion

Autogenous Osteochondral Plugs
12 patients, mean age 16.0 years, follow-up at 4.5 years
Hughston Rating Scale - 8 excellent, 3 good, and 1 fair
No complications arising from the donor site area
T2-MRI – Cancellous bone - Signal change of donor site - high to homogeneous by 1 yr post op
(Miura 2007)

Large osteochondral fragment with a thin wafer of bone
All Arthroscopic Suture Bridge
Parachute fixation for Large Femoral Osteo-Chondral fragments
(Trivedi, Lawrence, Ganley 2011)

Loose body/fragment removal
(creates full thickness lesion—see below)
Treatment of unstable lesions – detached

Fixation +/- graft
Recruitment - Mesenchymal Cell Stimulation (Not microfracture)
   Principally type I collagen with components of type II, VI, and IX (hyaline types)
   Technically simple / Single stage / Arthroscopic / Low morbidity / Cost effective
   Repair defects primarily with fibrocartilage – unpredictable durability
Indications
   Grade IV possibly grade III lesions / Intact “shoulders” / Perimeter contained
Autologous Transplantation vs. Microfracture in Adolescent patients
47 patients, mean age of 14.3 years, mean follow-up of 4.2 years
   Randomized to either the OATS (25 patients) or MF (22 patients)
   Grade 3 or 4 MFC Lesions
At 1 year - Good to Excellent - OATS 92% vs MF 86%
At 4.2 years - Good to Excellent – OATS vs. MF 63%
(Gaudas 2009)
OCD-Crater
Transplantation/Cartilage Replacement Techniques

Plugs

Allograft

ACI

OCD-Crater
Marrow Stimulation Techniques

Abrasion

Drilling

Microfracture
Osteochondral Allografts in Adults
64 patients – 65 knees, age 28.6 yrs (mean), Follow up 7.7 yrs (mean)
41 MFC lesions, 25 LFC lesions, All type 3 or 4
72% were rated good/excellent, 11% were rated fair, 2% was rated
poor. 15% underwent reoperation (Emmerson 2007)

Autologous Chondrocyte Implantation
37 patients, 14 w/ OCD lesions, age 16 (mean), 4.3 year follow-up
(mean)
23 had a prior cartilage repair procedure
35 patients had single defects
1 patient had an implantation that failed
32 patients had significant clinical improvements
(Micheli JPO 2006)

Current and Future Directions:
AAOS Guideline on the Diagnosis and Treatment of Osteochondritis Dissecans
Clinical Practice Guidelines Committee of the American Academy of Orthopaedic Surgeons
AAOS Guidelines available at www.aaos.org/guidelines

Research for Osteochondritis Dissecans of the Knee
Overview of Goals/Objectives:
- The Clinical Presentation
- Decision Making Algorithm
- Surgical Option

References

References
Discoid Meniscus

Introduction
The aptly named discoid meniscus describes a partially or completely disc shaped meniscus that may or may not have peripheral attachments.

Epidemiology
Incidence
0.4% to as high as 16.6% in arthroscopic studies/0-7% in cadaver studies
Prevalence 4-5% in USA
Highest prevalence reported in Asian population
Exact incidence may actually be higher since most cases are asymptomatic.
Medial meniscus as well as bilateral cases much less common.
Medial meniscus accounts for approximately 3% of all discoid menisci.

Classification

<table>
<thead>
<tr>
<th>Watanabe classification: based on arthroscopic appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Type 1-stable; complete; intact peripheral attachments</td>
</tr>
<tr>
<td>ii) Type 2-incomplete; covers less than 80%</td>
</tr>
<tr>
<td>iii) Type 3-“wrisberg ligament type”, thick posterior horn; lacks peripheral attachments</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hall classification: based on arthrographic findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Anterior horn</td>
</tr>
<tr>
<td>ii) Asymmetric</td>
</tr>
<tr>
<td>iii) Biconcave</td>
</tr>
<tr>
<td>iv) Forme fruste</td>
</tr>
<tr>
<td>v) Grossly torn</td>
</tr>
<tr>
<td>vi) Slab</td>
</tr>
<tr>
<td>vii) Wedge</td>
</tr>
</tbody>
</table>
Jordan classification: arthroscopic findings combined with the presence of clinical symptoms and presence or absence of meniscal tear

<table>
<thead>
<tr>
<th>Classification</th>
<th>Correlation</th>
<th>Tear</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable</td>
<td>Complete/incomplete</td>
<td>Yes/no</td>
<td>Yes/no</td>
</tr>
<tr>
<td>Unstable with discoid shape</td>
<td>Wrisberg type</td>
<td>Yes/no</td>
<td>Yes/no</td>
</tr>
<tr>
<td>Unstable with normal shape</td>
<td>Wrisberg variant</td>
<td>Yes/no</td>
<td>Yes/no</td>
</tr>
</tbody>
</table>

**Etiology**

Embryonic theory
Theory of arrested embryonic development/failure of resorption
Initial disc shaped mesenchymal structure which changes to semilunar shape
Theory later disproved since menisci do not form disc shape at any time during development

Congenital Theory
Abnormal formation of fibrocartilage in the mesenchyme
Combined theory-Congenital and Developmental
All anomalous shapes congenital
Anatomic anomalies plus repetitive shear = possible tearing and peripheral detachment
Increased thickness/abnormal attachments/decreased vascularization/mechanical stress
Detachment can occur posterior lateral or medial and anterior

**Clinical Evaluation**

History:
Clinical presentation dependent on type of discoid meniscus and associated pathology.
Most “stable” discoid menisci without any associated pathology will initially be asymptomatic and may be noticed as incidental findings.

Some “stable” can be variable symptoms include snapping, popping, giving way, pain during activity, locking, or limping. These findings more commonly found in patients with complete and incomplete types and in patients less than 15 years of age. Physical examination:
joint line tenderness, positive McMurray’s/Appley tests, effusion, limited range of motion.

Snapping Knee Syndrome
Palpable/visible/audible clunk as prominent lateral meniscal mass reduced with terminal extension/tibial shift may be visible. These findings frequently associated w/Wrisberg ligament
type in patients less than 8.

**Imaging**

- Plain Radiographs – standard AP lateral merchant views
  Findings may be subtle. Squared off LCF widening of the lateral joint space, cupping of the tibial plateau, dysmorphism of femoral condyles tibial spine hypoplasia, and fibular head elevation.

- Arthrography – used to confirm the diagnosis. Disadvantage – invasive technique and does not determine the amount of central degeneration.
MRI diagnosis:
  i) 3 or more consecutive 5mm thick sagittal slices demonstrating continuity between anterior and posterior horns.
  ii) Transverse meniscal diameter of greater or equal to 15 mm.
  iii) Coronal sections may show a complete meniscus
  iv) Thickened bow-tie appearance,

MRI can also aid in determining the presence of meniscal tears including intrasubstance delamination and mucoid degeneration.

Non-operative Management
Asymptomatic cases – often incidental findings. No treatment, continued observation.

Operative Management

- Partial saucerization/meniscectomy - treatment of choice for patients with symptomatic
  - Complete or incomplete menisci w/ a stable peripheral rim
  - Debridement of the meniscus is performed
  - Goal - maintain 6-8mm of peripheral meniscus
  - Await long term data on saucerization/sculpting

- Meniscal stabilization – treatment if instability is seen
  - May be combined with partial meniscectomy
  - For Wrisberg ligament type:
    - After reattachment meniscal thickening may remain.
    - Contour and thin remaining meniscus with the following goal:
      prevent recurrent snapping/shear/late OCDs

- Total meniscectomy – performed when meniscal tissue is unsalvageable
  - High rate of DJD long term although acceptable clinical results long term
  - Role of meniscal transplantation unknown

Outcomes

- Outcome Scale
  Excellent: Full ROM, no pain or snapping
  Good: Full ROM, infrequent pain w/exertion
  Fair: Full ROM, slight pain, knee snapping
  Poor: Recurrent locking or constant pain

- Partial meniscectomy arthroscopic average age
  10.5/52 children/f/u 5.5 yrs
  37%E/47%G/16% Fair – Michroth 1991

- Total meniscectomy
  15 cases – 8 w/OA - Washington 1995

- Total meniscectomy
  17 cases – 10/17 w/ symptoms 10/17 w/OA – Raber 1998

- Partial Meniscectomy
  16/17 G/E @ 10 yrs - Aglietti 1999

- Partial Meniscectomy
  29 knees – 16 yr f/u
  OA seen more in older pts
  Better results in younger pts – Okazaki 2006

- Revision Surgeries for Partial Meniscectomies
  39 cases/ repeat surgery 6 pts/7 knees
Horizontal tears
Reason: thickness/increased AP mobility/concentrated shear stress – Sugarawa 1991

▶ Surgical Counseling
Alert patients/families to recognize mechanical symptoms
Early intervention for patients w/mechanical symptoms to potentially prevent late irreparable meniscus changes
Note risk of OCD lesions prior to and after meniscectomies
Note potential for recurrent tears
Note potential for post surgical/recurrent mechanical symptoms

Maximizing Surgical Precision
Smaller arthroscopy equipment in smaller knees
Midpatellar portal or portals
Enhance visualization/eliminate “white wall of worry”
Other accessory portals
Angled/90º/back trimming/smaller forceps
Forceps/biter for meniscal excision full radius shavers for removal of loose tissue

References
Pediatric ACL Injuries
Theodore J. Ganley, M.D.
Director of Sports Medicine,
The Children’s Hospital of Philadelphia
Associate Professor of Orthopaedic Surgery,
The University of Pennsylvania School of Medicine

Epidemiology

High School Sports Injuries in the USA
- 2 million injuries per year
- Participation in organized athletics among females – 1000% Increase since 1972

Incidence of ACL Injuries
- General Population: .38/1000 pts/yr
- American Football Players: 42/1000 pts/yr
- Young Patients: Incidence Increasing
  - Year round sports / Earlier sport specialization
  - Multiple teams and sports in the same season

Who is most Susceptible to injury?
What are at risk sports/Where are adolescents getting hurt?

Injury Rate in Female vs. Male High School Athletes
- Injury Surveillance: Among males and females in the same sports
  - Nearly 800,000 athlete-hours of exposure time
  - Females in Soccer, Basketball, Running > Risk and Rate of LE injury

What are at risk positions? / Why are they getting hurt?

- Position of Risk – Less flexed/valgus/upper leg IR-lower ER/unbalanced
- Position of Safety – Flexed/Neutral hip rotation/flexed neutral knee/balanced

How frequently do younger patients get injured? / What is the incidence?

When do they get tibial spine fractures and When do they get ACL ruptures?

<table>
<thead>
<tr>
<th>Year</th>
<th>Study Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974 Rang</td>
<td>-ACL tears - rare</td>
</tr>
<tr>
<td>1979 Clanton</td>
<td>-1% incidence, 1,749 knee injuries</td>
</tr>
<tr>
<td>1983 DeLee</td>
<td>-1% incidence</td>
</tr>
<tr>
<td>1986 Lipscomb</td>
<td>-3.4% incidence, 710 reconstructions</td>
</tr>
<tr>
<td>1988 McCarroll</td>
<td>- 3.3% incidence, 1,722 cases</td>
</tr>
<tr>
<td>1993 Souryal</td>
<td>- 3% incidence, Prospective study of 902 HS athletes</td>
</tr>
<tr>
<td>2002 Hennrikus</td>
<td>- open physes – ACL ruptures &gt; spine fractures</td>
</tr>
</tbody>
</table>

- ACL vs. Tibial spine - 103 patients
  - Open physes: 22 ACL ruptures – 14 spine fractures
  - Closed physes: 45 ACL ruptures - 2 spine fractures  - Hennrikus

- Knee Hemarthrosis- Stanitski
  - Preadolescents 47% w/ACL tears, 47% w/meniscus tears
  - Adolescents 65% w/ ACL tears, 45% w/meniscus tears

What can we do to prevent these injuries?
Do these programs do anything to change strength and landing mechanics in younger patients?
Hypothesis
Prevention program/adolescent females/pre-practice/will increase strength/performance
Warm up/Dynamic stretching/strengthening/plyometric training/
Pre and Post testing – Biodex assessment / Jump/Hop/Drop Jump
Improvements for all 6 strength measures and all 3 performance measures
Hinger percentage improved from a prior “genu valgum biased landing”

Conclusion: 15-20 minute on field warm up prevention program before practice - successful in providing strength and performance results equivalent to off field programs
- Ganley, Albaugh

Video analysis of anterior cruciate ligament injury: abnormalities in hip and ankle kinematics
The effects of plyometric versus dynamic stabilization and balance training on lower extremity biomechanics
Biomechanical measures of neuromuscular control and valgus loading of the knee predict anterior cruciate ligament injury risk in female athletes: a prospective study
- Hewitt

Effectiveness of a Neuromuscular and Proprioceptive Training Program in Preventing Anterior Cruciate Ligament Injuries in Female Athletes: 2-Year Follow-up
Methods: 1401 female subjects – 52 teams – sports-specific training intervention – prospective non-randomized trial
Results: Year 1 – 88% decrease in anterior cruciate ligament injury in the enrolled subjects
Year 2 – 74% reduction in anterior cruciate ligament tears
- Mandelbaum

How do pediatric patients present? Anything unique about younger patients?
History
Pivoting, non-contact or direct blow, pop, effusion, recurrent giving way

Physical Examination
Evaluate contralateral knee, meniscal and patellofemoral provocative maneuvers
Instability Testing – Lachman, Anterior Drawer, Pivot Shift
Physiological Laxity- (+) Lachman, drawer, Bilateral, firm end point “trick movement”
Arthrometry – normal values higher in young patients - Flynn

Imaging
AP, lateral, notch, patellar views
MRI

Non-operative Treatment – What can we do if they get hurt?
Options
ABC’s
Activity Modification / Bracing / Continued Rehabilitation
Challenges

- Noncompliance
- Open physes
  - High risk of meniscal tears

<table>
<thead>
<tr>
<th>ACL Injuries</th>
<th>Meniscal Injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waldup 1979</td>
<td>1 pt 1 partial lateral</td>
</tr>
<tr>
<td>Lipscomb 1986</td>
<td>24 pts 14 medial / 9 lateral</td>
</tr>
<tr>
<td>Engebretson 1988</td>
<td>8 pts 3 medial / 1 lateral</td>
</tr>
<tr>
<td>McCarroll 1988</td>
<td>30 pts 16 medial / 8 lateral</td>
</tr>
<tr>
<td>Angel 1989</td>
<td>7 pts 5 tears</td>
</tr>
<tr>
<td>Graf 1992</td>
<td>12 pts 4 medial / 4 lateral</td>
</tr>
<tr>
<td>Ganley 2000</td>
<td>19 pts 12 tears</td>
</tr>
<tr>
<td>Aichroth 2002</td>
<td>45 pts 9 medial / 8 lateral</td>
</tr>
<tr>
<td>Ganley 2005</td>
<td>273 pts 114 tears</td>
</tr>
</tbody>
</table>

Natural History/Non Operative Treatment

- 32 patients - open physes/8yr followup
  - 25 partial tears - Excellent/good function
  - 7 complete tear - Poor long term function, symptoms, some OA – Kannus

- 23 patients, prospectively studied 10 yrs
  Tx – Bracing, activity restriction, Physical Therapy
  - 15 w/ associated meniscus tears
  - 3 osteochondral fractures
  - 10 w/Osteoarthritic changes - Aichroth

- 12 patients - open physes, acute intrasubstance, ACL tears
  - 8 received rehab
  - All braced patients developed instability
  - 7 sustained meniscal damage
  - Bracing alone does not prevent meniscal tears – Graf

Anterior Cruciate Ligament Rupture in Patients with Significant Growth Remaining:
What is the Risk to the Meniscus and Cartilage When Treatment is Delayed?
14 yr consecutive series / 70 knees in 69 pts / avg age 12.9 (range 10-14)
Statistical analysis - logistic regression, Fisher’s exact, Kaplan-Meier
Medial meniscus tears - independent risk factors:
  - Time to reconstruction (odds ratio 4) / A history of instability (odds ratio 11)
  - Delay in treatment also associated with tears of greater severity
Cartilage injuries – time to reconstruction independently associated with injuries
  - Medial/lateral/patellofemoral compartments – odds ratios 5/11/3 respectively
  - Delaying reconstruction- 4 fold inc in mm tears/11 fold inc in lat compartment injuries
  - Lawrence, Ganley

★ Determinants of Treatment- Decision Making
- Symptoms – instability/laxity
- Degree of skeletal maturity
- Associated pathology – chondral surfaces, menisci
- Compliance – patient, family

★ Determinants of Skeletal Maturity
- Growth relative to family members
- Growth spurt – yes/no
- Tanner stage – lower/higher
- Bone age – open/closing, <13♀, 14♂/13♀, 14♂

**Tanner Staging**

**Girls**

*Pubic Hair*

1. Preadolescent
2. Sparse, lightly pigmented, straight, medial border of labia.
3. Darker, beginning to curl, increased amount
4. Coarse, curly, abundant, but amount less than adult
5. Adult feminine triangle, spread to medial surface of thighs

*Breasts*

1. Preadolescent
2. Breast and papilla elevated as small mound, areolar diameter increased
3. Breast and areola enlarged no contour separated
4. Areola and papilla form secondary mound
5. Mature, nipple projects areola part of general breast

**Boys**

*Pubic Hair*

1. None
2. Scanty, long, slight pigmented
3. Darker, starts to curl, small amount pink texture altered
4. Resembles adult type, but less in quantity, coarse, curly
5. Adult distribution, spread to medial surface of thighs

*Penis/Testes*

1. Preadolescent
2. Slightly enlarged/enlarged scrotum, pink texture altered
3. Longer/larger
4. Larger, glands and breadth increase in size, scrotum dark
5. Adult size

**ACL Treatment – A Brief Overview of Reconstruction**

**Goals**

★ Regain static stability
★ Eliminate functional giving way
★ Protect menisci/chondral surfaces/remaining ligaments

**Primary Repair**

► 2 of 3 with giving way - **Delee**
► 8 of 8 with laxity - **Engebretsen**
● Poor results/limited numbers

**Extra-Articular Repair**

► Modified Andrews IT band technique
Symptomatic instability - **Graf**
► IT augmentation for isolated mid substance tears - **Delee**

**Intra-Articular Extraphysseal Procedures**

► IT band around femur, through notchplasty, “over the top”
- 17 patients: no intra-articular surg at 66.5 mos. avg. followup
★ Bone age used for surgical decision making – **Micheli**
★ Expanded Series - **Kocher**

**Intra-Articular Transphyseal Procedures**
**Soft tissue graft** - across femoral and tibial physes
- 19 pts nearing skeletal maturity

**Bone age used for surgical decision making**
- No significant LLDs or angular deformities
- Scanogram, long leg AP/LAT radiographs
- 16 of 19 returned to previous level of sports – **Ganley**

**Hamstrings**
- **- Epiphyseal tunnels only – not transphyseal**
  - Endobutton Femur/Screw and washer in tibial metaphysis
- 4.1 year average followup
- 1 pt shorter (3mm)
- 3 pts longer (2,9,10mm)
- Mean IKDC 96.5 (86-100) – **Anderson**

- **- All Epiphyseal tunnels / All Epiphyseal Fixation / Single Incision**
  - Antegrade femoral drilling – outside in
  - Retrograde tibial drilling – docking procedure
  - Intra-op CT Scan/Computer navigation
  - **Lawrence/Ganley**

**Combined ACL/MCL injuries in Adolescents**
- ACL Reconstruction/MCL Bracing
  - 180 pts/1997-2003 reviewed/mean age 15.6 (range 14-17)
  - 6.7% (12 of 18) w/ concomitant Grade II or III MCL
  - Control cohort of Isolated ACL reconstruction
  - Lyshol knee score/valgus stress/return to sport levels equivalent
  - Bracing of MCL followed by ACL reconstruction is effective
  - Findings consistent with adult literature
  - **Sankar/Ganley**
Algorithm for Treatment

```
ACL Tear
|
+---------------------+---------------------+---------------------+---------------------+
| Activity modification, | Activity modification, | Activity modification, |
| Bracing               | Bracing             | Bracing             |
| Closed chain rehabilitation | Closed chain rehabilitation | Closed chain rehabilitation |
|
+---------------------+---------------------+---------------------+---------------------+
| Asymptomatic         | Symptomatic         | Asymptomatic         | Symptomatic         |
|                      |                      |                      |                      |
| Skeletal maturity    | Skeletal maturity    | Skeletal maturity    | Skeletal maturity    |
|                      |                      |                      |                      |
| Accommodation        | Reconstruction      | Soft tissue transphyseal | Physeal sparing (Köcher/Micheli Anderson / Ganley) |
|                      |                      |                      |                      |
| Symptomatic          |                      | Soft tissue Transphyseal Reconstruction (Many Methods) |                      |
|
```

Survivorship/Sequelae

- Survivorship analysis of transphyseal reconstruction
  - 276 patients, single surgeon and technique (JRG)
  - Mean follow up 6.3 yrs (2-10)
  - 17 failures (7.8%) — Sankar / Gregg / Ganley

- Angular Deformity and LLD after ACL Reconstruction - Prediction
  - 13 year old male - Prediction
  - Distal femur - 21° angulatory deformity
  - Proximal tibia - 22° recurvatum deformity
  - Overall shortening - 2.5 cm - Wester

- Valgus Deformity requiring Femoral Osteotomy
  - Transphyseal screw – Koman

General Injury Prevention Measures – How to Prevent Kid’s Injuries

- Recognize health needs/health screening
- Recognize dangerous field conditions
- Ensure use of protective equipment
- Age appropriate sports training/knowledge
- Identify characteristics of those more injury prone
- Moderating excessive overly intense yr. round sports
- Ensure activity chosen is enjoyable/beneficial

Specific Injury/ACL Prevention Programs: Goals

- Prevent injury via strength/neuromuscular/awareness training
- Also improve from genu-valgum based landings
- Potentially prevent or decrease incidence of other lower extremity injuries
- Potentially prevent or decrease incidence of all injuries / all genders/all sports
- Incorporate prevention programs into practice sessions
- Develop neuromuscular training at early ages

Conclusions

- ★ Increased incidence of ACL/meniscus tears
- Nonoperative tx/primary repair - poor functional results
- Decision to delay surgery vs early ACL reconstruction – based on balancing the risks of each
  Shared decision making model is advised
  Data exists to help quantify the risks associated with delaying reconstruction
- ★ Transphyseal soft tissue grafts- preferable to have a developed chondroepiphysis

Future Directions – Where do we go from here?

- Healing - growth factors, gene therapy, stem cells
- ★ Outcome research/long term followup
- ★ Prevention strategies

References


Strength Training and Developmental Readiness for Sports
David L. Marshall, MD

30 minutes
Selection of appropriate sport activities require that the parent and medical provider understand the developmental skills and limitations of different age groups. These skills can be divided into three fundamental streams of development. These are:

1. **Neurodevelopmental** or gross and fine motor skill acquisition
2. **Social** or the ability to interact with teammates and coaches
3. **Cognitive** or the ability to understand rules, strategies, and following instructions

This session will explore the developmental readiness for children in the early childhood (2-5 years), middle childhood (6-9 years) and late childhood (10-12 years) who desire to participate in sports. Even thought skill and milestone acquisition usually follows a sequential course, speed of skill acquisition varies with each individual child. Specific skills needed for particular sports will be discussed as well as recommendations for appropriate sports based on developmental skill level.

**Part 2: Strength Training in Youth**
Despite previous beliefs that strength training in youth was unsafe and ineffective, new research indicates that children and adolescents may benefit from properly designed and supervised strength training programs. This session will discuss the common myths associated with youth strength training, the injuries associated with strength training and guidelines on developing a safe and effective strength training program for youth.
25 minutes

In the past 15-20 years, the number of youth participating in recreational school sponsored sporting activities has rapidly increased. Along with the increasing number of youth participants, injuries related to sports participation are also on the rise. There seems to be a shift in the patterns of injuries encountered by the primary care physician and sports medicine physician. Previously, macrortraumatic injuries (fractures, sprains, strains, dislocations) predominated. Recently, microtraumatic injuries, or injuries from chronic repetitive motions are frequently encountered. Reasons for this include the young age at which kids begin intense training and competition, early specialization, inadequate coaching and supervision, and delayed recognition of early injury patterns. The primary care physician must be able to recognize the signs and symptoms of overuse injuries through a thorough history and physical examination to initiate proper treatment recommendations.

30 minutes

The practice of medicine is predominantly reactive, meaning clinicians get involved after one becomes injured or ill. However, injury prevention, or taking a proactive approach to injury and illness is very important in sports medicine, as a significant number of sports injuries can be avoided or the severity lessened by some basic prevention strategies. A prevention program requires identification of risk factors for certain injuries. These risk factors can be divided into intrinsic and extrinsic. Intrinsic risk factors relate to the individual participant and include age, gender, weight, general health and fitness, and anatomic factors such as flexibility, strength, joint stability and foot type. Extrinsic factors relate to the sports environment and the equipment involved. These may include field surface, weather, coaching, training techniques and protective equipment. The clinician must be aware of the impact these risk factors have on the prevention of injury.
New Developments in the Management of Concussion in Sport

David L. Marshall, MD

20 minutes

For years, the medical community has debated the optimal management for concussion in sports. As the body of research grows, new recommendations for the management of concussions are offered. The International Symposium for Concussion in Sport met in Zurich in 2008 and published guidelines for concussion management. Although research on concussion in youth is limited, the guidelines provide a framework of optimal management of youth concussions. Key elements in managing youth concussions are:

1. Understanding the definition of a concussion
2. Recognizing the signs and symptoms of concussion
3. Immediate management
4. Follow-up and return to play guidelines
5. Educating all those involved in the “concussion management team” including parents, teachers, coaches, school administrators, game officials and physicians

The Role of Conservative Treatment and Prevention in Lower Limb Injuries

David L. Marshall, MD

20 minutes

Common injuries to the lower limb in youth sports include patellofemoral stress syndrome, Osgood Schlatter disease, Sinding-Larsen-Johansson Syndrome, medial tibial stress syndrome and Sever condition. All are considered to be overuse in nature, caused by chronic repetitive submaximal stress applied to a particular tissue. Prevention strategies include understanding the extrinsic as well as intrinsic factors involved in overuse injuries and recommending appropriate modifications and treatments.
How to Build a Physical Activity Program for the Growing Athlete
Eli Sadres M. Med. Sc Wingate Institute elis@wingate.ac.il

Planning of physical activity and training in general lean on training principles which base on sciences. Experience of community of physical activity and sport and exploratory findings on reactions to physical activity results of trainings processes and physiological and mental adaptabilities of sportsmen to the different schemes of programs of exercise, serve basic information to planning the training method.

Principles of exercise and in them: Gradual in loading, regulation of load and recovery, periodization, individualization, right relation between specific and general preparation, diversification in loading, constitute basis in the information that serve to planning of process of exercise that his target is to occur adaptations in the body of the individual in order to promote, to preserve or to moderate the decrease of performance and physical ability.

Targets of the exercise fall in one of two of the next groups: 1. promote health or 2. Promote of achievements and athletic performances. Planning of the exercise will be adapted to the targets that were placed and to his condition of the individual. From here, that composition of the exercise that contains a different framework of: Contents, form, type, resources and method, there will be is adapted to the situation of datum.

Children are not little adults. Exploratory findings and reports of trainers and physical activity instructors place nowadays data bank on way of planning of the physical activity and the athletic exercise of children with respect to beneficial and efficiency of the exercise to this adolescent and children without hurting their health and without hurting the rhythm of their growth, and still to determine the right dosages to health promotion, and to achieve high competitive sport performance.

Nowadays there is a wide scientific agreement on from of training descriptions that are beneficial to health. The recommendations are a daily activity of 60 minutes and more in order to receive bodily recompenses. Other descriptive recommendations of these usefully also during more short of activity but by closings are medium to high intensity and in the weekly frequency 3-5 in units in the week. Type of the activity is based in the young age on basic skills and pursuant more compounds. In the age of the adolescence the emphasis are special to exercises of the physical ability and the fitness for health be fond of: cardiovascular endurance, endurance of muscles, power of muscles and flexibility.

When targets of the exercise are performances and athletic achievements, diagnoses on ability of adaptability of the child and the adolescent to different stimulations of exercise are the basis to design a program upon the different components of the fitness.

By the presentation of this subject will be brought for example from descriptions exercises are different for children and adolescent accordingly to the age and the components of the ability that are trained.
The effect of aerobic training on pulmonary functions in lung diseases with chronic allergic airway inflammation (asthma).

Ruth Soferman MD,
Pediatric-Pulmonologist
Director of the Pediatric-Pulmonology Clinic, Dana Children's Hospital
Sourasky Medical Center, Tel-Aviv, Israel

Abstract

Physical activities can cause an acute exacerbation of asthma in about 80% of asthmatic children, and so they usually refrain from participating in sports. Studies on asthmatic children and experimental murine models of allergic asthma showed that supervised aerobic training improved pulmonary functions, reduced bronchial hyper-reactivity, improved quality of life, and reduced the markers of airway inflammation (1,2,3,4).

Swimming routinely in a non-chlorinated outdoor pool (26°C, 95% CI: 24–28), a 10-min warm-up consisting of breathing exercises in water, 30 min of swimming training and a 10 min cool-down, all supervised by certified swimming instructors, did not increase the risk of asthma or allergic symptoms. Swimming was associated with improved lung functions and lower risk of asthma symptoms, especially among children with preexisting frequent acute exacerbations (5). Another study described improvements in asthma severity, mouth breathing, snoring, chest deformity and self-confidence, as well as fewer doctor visits, hospitalizations and school absence (6).

There is also evidence of physiological benefits of yoga in the asthmatic pediatric population that may benefit children through the rehabilitation process (7).

One study using an asthma murine model showed that aerobic training reversed airway inflammation and the remodeling process (8), and another study on a similar model demonstrated that aerobic training reversed airway inflammation and remodeling, improved respiratory mechanics and reduced the Th2 immune response. These effects seemed to occur in response to a decreased expression of NF-κB and an increased expression of anti-inflammatory cytokines IL-10 and IL-1ra. (4).

Children with mild-moderate asthma who benefited from physical training showed reduced bronchial hyper-reactivity, improved lung functions, reduced acute exacerbations and reduced cysteinyl leukotrienes in breath condensate (9). The conclusion of these studies is that exercise training and swimming might play an important role as an adjunct strategy in the treatment of lung diseases with chronic allergic airway inflammation (i.e., asthma).

References:

1. Respiration. 2010 May 22 Epub ahead of print
3. Eur Respir J. 2010 May;35(5):994-1002
8. Eur Respir J 2010: 35:994-1002
Anterior knee pain in Children and Adolescents

Dr. M. Yaniv

Sport’s Injuries and Arthroscopic Surgery Service  Dept. Pediatric Orthopaedics Dana Children’s Hospital Tel Aviv Sourasky Medical Center & Sackler Faculty of Medicine, Tel Aviv University

Anterior knee pain is one of the more difficult to treat problems in musculoskeletal medicine. Sources of pain are poorly understood and frequently there are multiple and combined. Mixing pain and instability makes the diagnosis and treatment plan more difficult. Unique considerations are mandatory for children and adolescents due to exclusive anatomic, physiologic and psychological issues of this special group of patients. Issues like growth spurt, limb alignment, and exclusive anatomic issues like apophysis and epiphysis should be considered in diagnosis as well as in treatment plan. The definition of the anatomic and pathophysiologic source of the pain stands in the base of proper diagnosis and treatment considerations.

This lecture will present the common entities accountable as leading to anterior knee pain like Apophysisits, tendinipaties, pain associated with chondral compression, fat pad induced pain, plica syndrome, and pain generated from patellar retinacula. The presentation will emphasize the stepwise approach to obtaining the right history followed by an examination that identifies the sites of pain in order leads to appropriate diagnoses and treatment.
Bone and exercise.
Leonid Zeitlin, MD

Metabolic and Genetic Bone clinic,
Orthopedic department,
Dana Children`s Hospital, Tel Aviv Medical Center

Exercise has beneficial effect on bone health along the life cycle. It is especially important for normal skeletal development during childhood and adolescent growth.

Pediatric osteoporosis can be effectively prevented and treated by certain types of physical activity.

New knowledge accumulates rapidly in this field.

This talk will concentrate first on modern theory of muscle-bone relationship.

The discussion will focus then on types, frequency and duration of exercise giving the maximal results on bone strength in health and disease.

Practical recommendations will be given based on current knowledge.

Alternative types of muscle activation, such as vibration and electric stimulation, will be discussed.

Finally, I will point out adverse effects of excessive and incorrect exercise on bone health.