ANTERIOR CRUCIATE LIGAMENT INJURY PREVENTION IN NEW ZEALAND

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NO DISCLOSURES
ACL INJURY PREVENTION

Knee injuries involving the ACL are common in sport

ACL injuries are serious resulting in permanent disability

ACL injury prevention programs can reduce injuries by 60%
ACL INJURY

Non-contact ACL injury mechanism: deceleration and changing direction

Females have much greater risk (4-6 times the risk in males)

High risk sports in NZ

- Rugby
- Netball
- Football (Soccer)
- Snowsports
ACL INJURY
DIAGNOSIS

History

Deceleration – rotation injury
“Pop” or “Snap”

Early swelling (Haemarthrosis)
ACL INJURY
DIAGNOSIS

Examination

Modified anterior drawer (Lachman test)
ACL INJURY
DIAGNOSIS

Imaging

Xray to exclude fracture

MRI scan if diagnosis in doubt
ACL INJURY INCIDENCE

Sweden  80 per 100,000 population per year
High risk sports
    2 ACL injuries per 1000 match hours
    3% per player per year

Scandinavia  35% - 50% undergo ACL reconstruction surgery
ACL INJURY
NEW ZEALAND

2013

ACC funded ACL reconstruction surgery for 2,948 patients
Estimated more than 5000 ACL injuries per year
2013 ACC data

Male  1839  62%
Female 1109  38%
### 2013 ACC data

<table>
<thead>
<tr>
<th>Age</th>
<th>Count</th>
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<tr>
<td>0-14</td>
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<td>&gt;40</td>
<td>619</td>
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<tr>
<td>Sport</td>
<td>ACL Reconstructors</td>
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<td>Rugby Union</td>
<td>411</td>
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<tr>
<td>Netball</td>
<td>406</td>
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<tr>
<td>Football (Soccer)</td>
<td>395</td>
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<tr>
<td>Touch Rugby</td>
<td>185</td>
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<tr>
<td>Snowsports</td>
<td>149</td>
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<td>Basketball</td>
<td>109</td>
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<td>Rugby League</td>
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2013 ACC data

Rugby Union
Netball
Football (Soccer)

Rugby (Union, Touch, League)
Netball
Football (Soccer)

ACL RECONSTRUCTION
SPORTS

55% 68%
ACL INJURY

- Functional instability
- Secondary joint damage
- Osteoarthritis

Substantial healthcare costs
ACL INJURY
COSTS

ACL Reconstruction

Surgery $29.5 million
Weekly compensation $8 million
Other costs $3-$5 million est
(Drs, Physios, Imaging)

Total healthcare costs $40-$42.5 million per year

ACC 2013 data
ACL INJURY
MENISCAL TEARS

Acute ACL tears associated with high incidence of meniscal tears (40%-60%)

Risk of meniscal tears increases with time with untreated ACL injuries

Over 10 years 30% of patients with untreated ACL injuries will require meniscus surgery

In patients who undergo ACL reconstruction >10% will require additional meniscus surgery at a later date

Estimated 1000-1500 meniscal surgeries related to ACL injury
ACL INJURY
COSTS

Meniscal surgery
  Surgery                        $4.5-$6.5 million est
  Other costs                   $3.5-$5.5 million est

Total healthcare costs        $8-$12 million est
ACL INJURY
OSTEOARTHRITIS

High incidence of OA following ACL injury (70-80% long term xray)

Meniscectomy major risk factor for knee OA

25% of knee OA population may be ACL deficient

No evidence that ACL reconstruction alters natural history of OA
2013 ACC data

ACC funded 377 knee replacement surgeries for post-traumatic arthritis

Some of these patients

Menisectomy unrelated to ACL injury

Small number related to fractures

Majority of these patients OA related to ACL injury

Estimated costs $5-$6 million
ACL INJURY
ACC DIRECT COSTS

ACL Reconstruction  $40-$42.5 million
Meniscectomy       $8-$12 million
Total knee replacement $5-$6 million

Total cost         $53-$60 million
ACL INJURY
ACC INDIRECT COSTS

Estimated 40,000 individuals in NZ living with knee OA related to ACL injury

Knee OA impacts on workplace participation

Estimated indirect cost of $100 million per year in lost productivity
ACL INJURY

In young athletes time lost from school and sports participation impacts on mental health and academic performance.

ACL injury most common season ending injury and injury requiring surgery in high school athletes in USA.

Significant drop in academic performance in college students undergoing ACL reconstruction.
ACL INJURY PREVENTION

HISTORY

1990  Henning USA  College basketball

Knee flexion on landing
Rounded turns
Deceleration with multi-step stop

89% reduction in ACL injuries in intervention group
ACL INJURY PREVENTION
HISTORY

1996 Caraffa Italy Semi-professional and amateur soccer

Proprioceptive balance training program
Prospective study of 600 players

87% decrease in ACL injuries in intervention group
1999 Hewett USA College athletes

Neuromuscular training program

1263 athletes

Incidence of serious knee injury 2.4-3.6 times higher in untrained group
ACL INJURY PREVENTION
RISK FACTORS

Genetic
Gender
Anatomic
Hormone
Neuromuscular
Biomechanical
ACL INJURY PREVENTION

Modifiable risk factor
Neuromuscular control deficits in jump landing
Valgus knee collapse characteristic of female ACL injury
ACL INJURY PREVENTION

1998 - 2001 Myklebust  Norway  Elite female team handball players

5 phase proprioceptive training program
1800 elite female team handball players

20% reduction in ACL injury in first season
40% reduction in ACL injury in second season
ACL INJURY PREVENTION

Oslo Sports Trauma Research Centre
ACL INJURY PREVENTION

2001 Silvers, Mandelbaum
USA, Santa Monica
Young female soccer players

Santa Monica PEP ACL prevention program
14-18 yr old female soccer players
1041 players intervention group
1905 players control group Non randomised

88% reduction in ACL injury in first season
74% reduction in ACL injury in second season
<table>
<thead>
<tr>
<th>Year</th>
<th>FIFA 11/11+</th>
<th>Description</th>
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<tbody>
<tr>
<td>2006</td>
<td>FIFA 11+</td>
<td>Collaboration involving Norwegian and USA, Santa Monica groups.</td>
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<tr>
<td>2008</td>
<td>FIFA 11+</td>
<td>RCT in young female soccer players. 1892 players age 13-17. 44% reduction in knee injuries. 27% reduction in ankle injuries.</td>
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</table>
ACL PREVENTION PROGRAMS

Strength  Resistance training
Power    Plyometrics, jump training
Co-ordination  Balance training

Jump landing
  Two leg landings
  Hip, knee flexion

Avoiding knee valgus – hip, knee, toe in line
<table>
<thead>
<tr>
<th>ACL PREVENTION PROGRAMS</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>Oslo Sports Trauma</td>
<td>Likely to be most effective for netball</td>
<td>Requires wobble board equipment</td>
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<tr>
<td>Santa Monica PEP</td>
<td>Simple, no equipment, Not exclusive to soccer</td>
<td>May be less effective for netball</td>
</tr>
<tr>
<td>FIFA 11+</td>
<td>Simple, no equipment, Most widely used, Also prevents ankle, hamstring injuries, Excellent resource materials</td>
<td>May be less effective for netball</td>
</tr>
</tbody>
</table>
ACL PREVENTION PROGRAMS

15-20 minutes 3 x week

6-12 weeks before intervention fully effective

Age 14 years upwards
ACL INJURY PREVENTION IN NZ

Public awareness program
Targeted ACL prevention programs
Clinical research
National ACL registry
ACL INJURY PREVENTION IN NZ

Public awareness program

Improve diagnosis and treatment

ACL prevention works

Public awareness improves compliance with prevention programs
ACL INJURY PREVENTION IN NZ

Twist, “Pop”, Swell means ACL
ACL INJURY PREVENTION IN NZ

Norway

Substantial reduction in ACL injury rate after 2005 public information campaign
Targeted ACL prevention programs

High school athletes playing high risk sports
- Rugby
- Netball
- Soccer football

Female athletes playing high risk sports
- Netball
- Soccer football
- Touch rugby
- Rugby
ACL INJURY PREVENTION IN NZ

Clinical research

Measure efficacy and cost-benefit of ACL prevention programs in NZ
ACL INJURY PREVENTION IN NZ

National ACL registry

All patients undergoing ACL reconstruction registered

Norwegian registry established 2004

Registries established in Norway, Sweden, Denmark and some parts of USA

Registries planned in NZ, Australia

Outcomes measure function, failure and need for further surgery
ACL injuries are a major public health problem
ACL prevention is effective
Co-ordinated approach requires collaboration of key stakeholders