

Return to Sports after Knee ACL Injury for World Class Athletes

Prof. NICOLAAS C. BUDHIPARAMA Jr., MD., PhD (LUMC, NL), PhD (UGM, ID)

School of Medicine University of Airlangga - Indonesia

Leiden University Medical Centre - The Netherlands

Nicolaas Institute of Constructive Orthopaedics

Research & Education Foundation for Arthroplasty & Sports Medicine

Indonesia - The Netherlands

Disclosure

- Collaborators : Nanang Kusuma
- Professor, School of Medicine, University of Airlangga, Surabaya - Indonesia
- Associate Professor, Department of Orthopaedics, Leiden University - The Netherlands
- Senior Lecturer, University of Gadjah Mada, Yogyakarta - Indonesia
- Founding Godfather of ISAKOS Global Connection
- 2nd Vice President of Asia Pacific Orthopaedic Association (APOA) 2022 - 2023
- Past President of Arthroplasty Society in Asia (ASIA) 2019 - 2022
- Past President of Asia Pacific Knee Society (APKS) 2019 - 2022
- Past President of Asia Pacific Arthroplasty Society (APAS) 2020 - 2022
- Consultant for :
 - DePuy Synthes, Zimmer Biomet, Gruppo Bioimpianti
- Editorial Board / Reviewer : CORR, Bone Joint Journal, J Arthroplasty, AJSM, VJSM, BJO, KSSTA, JISAKOS, Knee, OJSM, JOS, KSRR, The Hip & Knee Journal, JOSR

How Would You Treat This Case ?

Conservative vs Surgery



Treating World Class Athlete

9 months after injury : Winner of New Zealand Open 2017



Treating World Class Athlete

CONTROVERSY ISSUES :

- Individual or team sport
- What is their ranking in the elite group of the world currently ?
- Conservative or ACL reconstruction
- Percentage of athletes that go back to their previous ranking after surgery

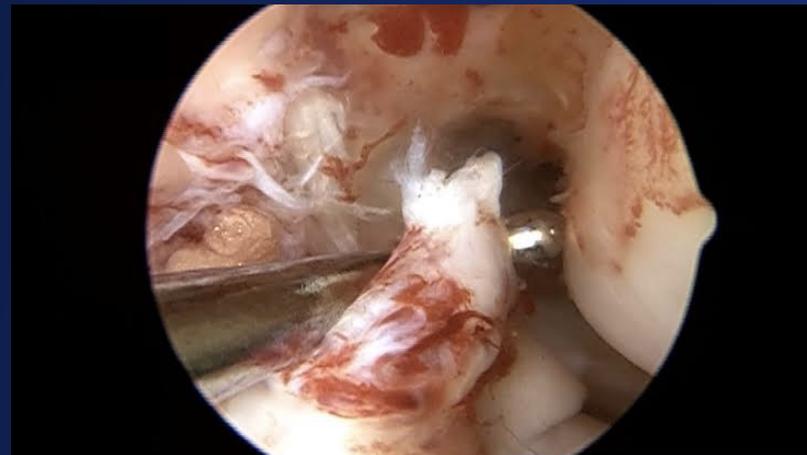
Treating World Class Athlete

CONTROVERSY ISSUES :

- Psychological readiness and prevention for second ACL-RSI
- If the world-class athlete takes ACL reconstruction, how to accelerate their rehabilitation so they can go back to field/competition as soon as possible while validity of return to sports testing states that in fact 6 months is not enough, 12 months is needed

Numbers of ACL Injury

- Anterior cruciate ligament (ACL) injury is one of the **most common serious knee injuries occurring in athletes**
- The incidence of ACL ruptures : 30 - 78 per 100,000 person / years
- Female has **3-8 times risk of injury compared to male**
- **70-80% of ACL injuries are non-contact-related and occur in all types of sports, at all levels of play**
- **Peak incidence : female: 14-18 yrs, male: 19-25 yrs (Sanders et al., 2016)**



ACL Injury

Important Issues :

- To operate or not ?
- Will operation make the athlete **return to sports faster or disappear totally** from their profession ?
- If you choose for operation, important to choose the :
 - Correct technique
 - Proper timing
- **As a surgeon, do you follow up the rehabilitation ?**



Professional Athlete Gone After Surgery

TRİYATNO

Lahir: Metro, Lampung, 20 Desember 1987

Istri: Riska Anjani Yasin

Anak: Verro Alexi Olympian

Pendidikan:

- SDN Metro, Lampung, lulus 2000
- SMPN 1 Parung Panjang, Bogor, lulus 2004
- SMAN1 Parung Panjang, Bogor, lulus 2007

Prestasi



Triyatno lebih tenang dan lebih giat berlatih.

Puncak prestasi

Sebelum Olimpiade London 2012, otot *meniscus* di lutut Triyatno sobek saat latihan. Namun, ia tetap menjalani lomba menggunakan *tapping* serta alat penjaga lutut.

"Masih terasa sakit saat lomba di Olimpiade, tetapi tertutup adrenalin saya. Pada *clean and jerk*, saya coba mengangkat beban 188 kg pada angkatan ketiga. Saat itu saya sulit berdiri diam dan masih agak lari-lari sampai waktunya habis. Untungnya, ketiga wasit mengangkat bendera putih dan saya menjadi peringkat kedua, merebut perak," kata Triyatno.

Raihan itu menjadi puncak prestasi Triyatno. Pada 2013, Triyatno harus menjalani operasi untuk menyembuhkan cedera lututnya. Sejak itu, prestasi Triyatno terus menurun. Pada Pelatnas SEA Games 2017, Triyatno meninggalkan asrama karena kelasnya ditempati atlet lain.

INFOGRAFIK: GUNAWAN



Professional Athlete Gone After Surgery

Di Mana Kau Sarwendah?

Di mana kau, wanita pebulu tangkis perebut Piala Dunia 1990 dan dulu dilukiskan sebagai pengganti Susi Susanti?

Kariernya seakan lenyap begitu saja. Sirna masa depan dan kejayaan olahragawan yang semula...

...gembira. Di tengah-tengah kariernya sebagai pemain bulu tangkis Indonesia, memang kemudian menjadi pertanyaan besar, mengapa Sarwendah hilang?

...nyanya pupus di tengah kariernya. Di saat sarwendah putus urat pengikat lutut ketika melawan pemain Malaysia Zarinah Abdullah di Kejuaraan Malaysia Terbuka, Kuching, Juli 1993.

Enam hari setelah cedera, begitu tiba kembali di Tanah Air, Sarwendah menjalani operasi penyembuhan. Segala upaya dilakukan, tetapi gerak lututnya masih tetap kurang wajar. Bila ditekuk masih terasa sakit.

Risiko cedera bagi olahragawan tidak hanya menimpa Sarwendah. Boris Becker (mantan) pemain tenis nomor satu dunia asal Jerman, pernah ditimpa musibah serupa. Juara tiga kali turnamen Wimbledon ini mengalami cedera punggung ketika berlaga di Madrid Open pada bulan April 1992.

"Saat itu dia terpaksa mengundurkan diri dari turnamen. Be-



CIDERA SARWENDAH — *Sayang, sangat disayangkan, Sarwendah pemain bulutangkis andalan Indonesia, dalam salah satu kesempatan bertanding mendapat cedera otot. Sayangnya lagi, penanganan cedera terlambat sehingga pecinta bulutangkis harus menerima kenyataan Sarwendah menggantung raketnya.*

Sebagai tindak lanjut lokakarya, hari Kamis (15/8) mereka bertiga memeragakan metode baru dalam operasi cedera lutut. Tiga olahragawan Indonesia, yang sedang dalam kondisi pincang karena cedera selama dalam pusat latihan, siap diuji coba.

"Sebenarnya, metode operasi ini sudah dikenal lama. Tetapi dengan memvaksinasi langsung proses

an otopedi kini dan di masa mendatang untuk memulihkan cedera persendian semakin besar, perhatian pada disiplin ilmu tersebut masih kurang. Dari sekian banyak fakultas kedokteran, baru tiga universitas menyelenggarakan pendidikan spesialisasi otopedi. Itu pun belum merupakan bagian khusus.

Cidera patah tulang umumnya terjadi karena kecelakaan. Se-

tertentu yang secara higienis malah kurang bisa dipertanggungjawabkan."

IOA sudah pernah melakukan penataran kepada para dukun patah tulang, untuk meningkatkan pemahaman mereka terhadap kebersihan pengobatan. Sayangnya, perhatian dan pemahaman masyarakat terhadap disiplin cabang ilmu otopedi masih sangat

Introduction

Torn ACL will not heal by its own, but does intact ACL is a must in every person ?



- The ideal treatment strategy depends on :
 - Patient-specific factors (age, occupation)
 - Desired activity level, and a willingness to undergo an extensive rehabilitation regimen

The Longest Men's Double World Champion Badminton

FOTO : GETTY IMAGES
SOURCE : BWF



**200
WEEK**

CONGRATULATIONS
MARCUS FERNALDI GIDEON
& KEVIN SANJAYA
WORLD NO#1
SINCE 28 SEPTEMBER 2017

 BadminTour.com  Badmintour_com  BadmintonTour  BADMINTOUR TV



Kevin Sanjaya & Marcus Gideon
Badminton World Champion
2017 – 7x winner, 2018 – 9x winner

Return to Sports after Knee ACL Injury for World Class Athletes



Introduction

- Most recent consensus for ACL injury, **both operative and conservative are acceptable treatment option**
- **They have the same goal :**
 - Restore normal arthrokinematic
 - restore stability
 - prevent giving way
 - Faster RTS
 - Delay further meniscal injury
 - Delay OA – multifactorial and inconclusive data
- Both operative and conservative, **patient must undergo strict protocol of rehabilitation to maximize the result of treatment**

- *Diermeier et al, Br J Sports Med 2021*
- *Beaufils et al, Orthop Traumatol Surg Res, 2009*



Controversy of Conservative Treatment

- A matched paired study non-operative treatment resulted in an **earlier return** (non-operative 3–4 months vs operative 6–12 months) **and a higher return to level II sports** (non-operative 88.9% vs operative 77.8%) as compared with operative treatment
- Except, if during the non-operative treatment, **subjective instability persists or episodes of giving way occur**, consideration of **ACL reconstruction is recommended**

Grindem et al. Am J Sports Med 2012



Fate of Knees w/ or w/o ACL Surgery ?

AJN ▼ April 2017 ▼ Vol. 117, No. 4

Surgical vs. Conservative Interventions for Treating ACL Injuries

By Cresilda T. Newsom, DNP, MSN, RN, CPAN

COPYRIGHT © 2014 BY THE JOURNAL OF BONE AND JOINT SURGERY, INCORPORATED

Nonsurgical or Surgical Treatment of ACL Injuries: Knee Function, Sports Participation, and Knee Reinjury

The Delaware-Oslo ACL Cohort Study

Hege Grindem, PT, PhD, Ingrid Eitzen, PT, PhD, Lars Engebretsen, MD, PhD,
Lynn Snyder-Mackler, PT, ScD, SCS, ATC, FAPTA, and May Arna Risberg, PT, PhD

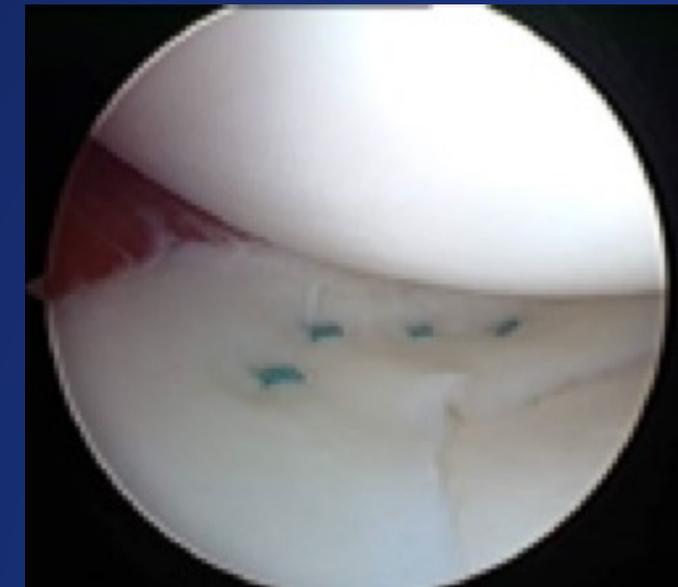
Investigation performed at the Norwegian Research Center for Active Rehabilitation, Department of Sports Medicine, Norwegian School of Sport Sciences, and the Department of Orthopaedics, Oslo University Hospital, Oslo, Norway

Result showed no difference between surgery and conservative treatment in patient reported knee scores @ 2 & 5 years



If So, Why Offer ACL Reconstruction ?

Basically to deal with symptoms of instability & possibly to protect meniscus function



Operative Treatment

“Fear of re-injury”

- Injury itself
- Surgery
- Rehabilitation
- Time off work
- Loss of income



Operative Treatment

- **Currently, no evidence-based arguments exist to recommend a systematic surgical reconstruction to every patient with an ACL injury**
- **Patient whom seek for category I activity should not delay surgery as the risk of secondary damage to the knee (e.g. meniscus, cartilage)**
- **Concomitant injury !!! of other stabilizing structure (ligament, meniscus or cartilage) affect the decision to operative treatment**

Grindem et al. J Bone Joint Surg Am, 2014



Timing of Surgery

Systematic Review

Arthroscopy. 2013 Nov;29(11):1863-71. doi: 10.1016/j.arthro.2013.07.270. Epub 2013 Sep 18.

Timing of Surgery of the Anterior Cruciate Ligament

Daniel Andernord, M.D., Jón Karlsson, M.D., Ph.D., Volker Musahl, M.D.,
Mohit Bhandari, M.D., Ph.D., Freddie H. Fu, M.D., D.Ps., D.Sc., and
Kristian Samuelsson, M.D., Ph.D.

3583 patients (22 articles) – Jan '95 – Aug '11

- **Early (2 days – 7 mths) vs delayed (3 wks – 24 yrs)**
- 8 articles promote early reconstruction
- **Majority (12) – NO difference b/n early vs delayed surgery**
- 2 articles inconclusive
- Few or no subjective & objective outcomes related to timing of ACL surgery

Operative Treatment

- ACL injuries often occur together with concomitant injury to other knee structures, with meniscal injuries reported in 23% – 42%, cartilage lesions in 27%, and combined meniscal and chondral lesions in 15% of cases
- Operative management is superior to non operative in patient with concomitant meniscal lesion which repairable and multiple ligament injuries

Tips & Tricks Affecting Success of Knee Surgery

Pre-op limitation of motion:

Critical that surgery should be delayed until :

- Patient's knee recovered from acute trauma
- Range of motion (esp. extension) restored through PT

EXCEPT when:

- Co-existing complete tear of lateral & posterolateral structures

..... then surgery to be done within 10-14 days

Tips & Tricks Affecting Success of Knee Surgery

What if a large displaced medial bucket handle tear prevents full extension ?

- Either excision or repair of bucket handle only
- **DO NOT** perform a simultaneous ACLR
- **Elective ACL reconstruction scheduled only after patient has recovered their ROM from meniscal problem !!!**



Jonathan Christy
World's ranking #3



Marcus Gideon
Badminton World
Champion

Major Questions ???



How good are we at returning athletes to sports ?

Who is ready and who is not ?

Why Do Surgeons Refer Patients for RTS Testing ?

Primary question - is it unsafe for this person to :

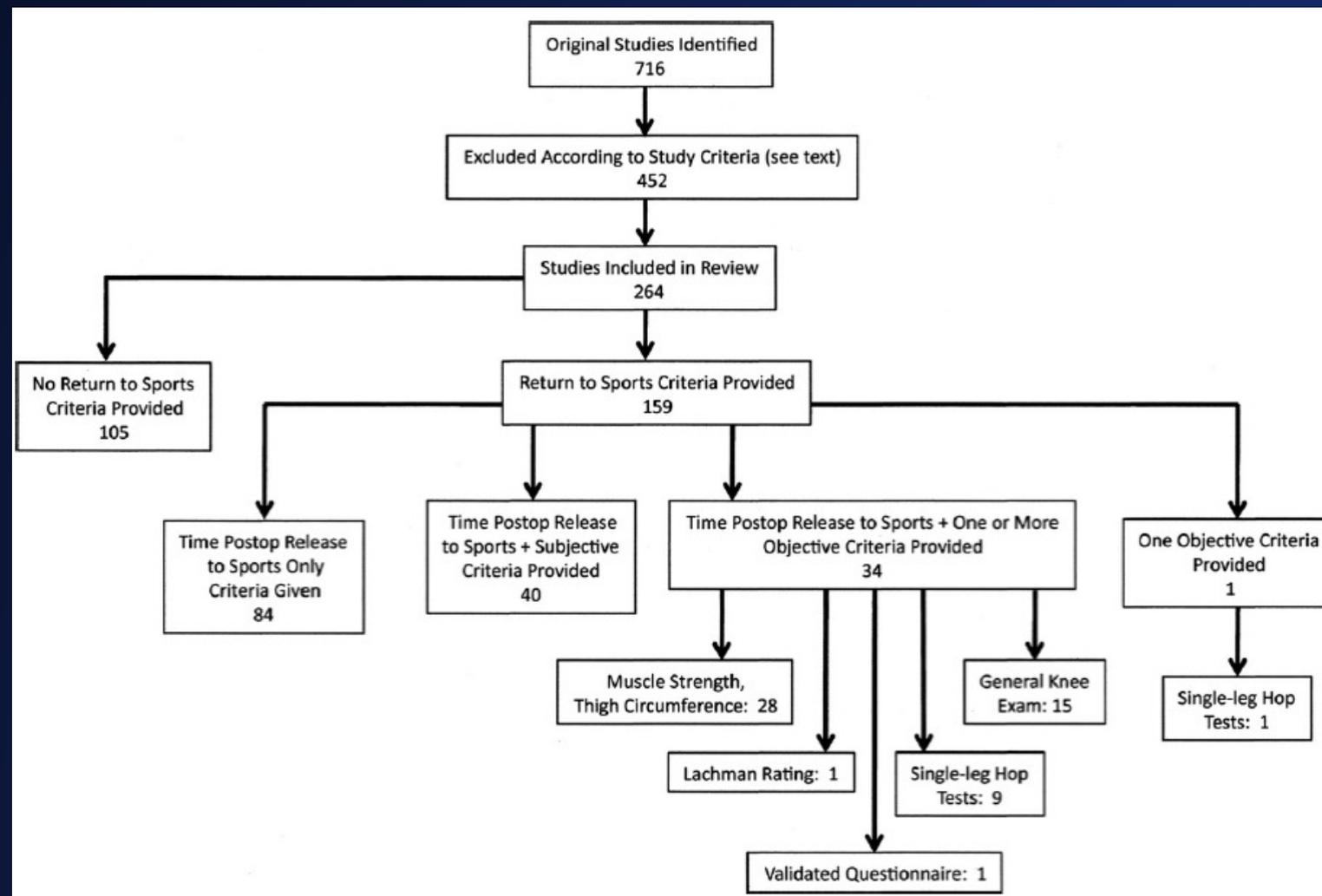
- Return to sports ?
- Return to practice ?
- Return to competition ?



How do Surgeons Clear Patients for Sports After ACLR ?

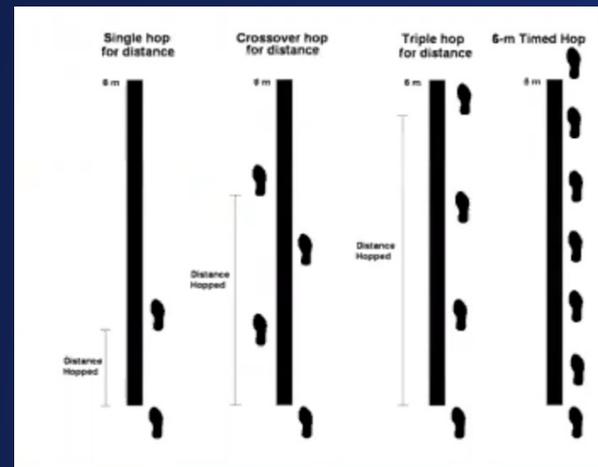
Systemic Review With Video Illustration Factors Used to Determine Return to Unrestricted Sports Activities After Anterior Cruciate Ligament Reconstruction

Sue D. Barber-Westin, B.S., and Frank R. Noyes, M.D.



Return to Activity Test Battery

Test	Score
Quadriceps Strength Index	$\geq 90\%$
All 4 single-legged hop tests	$\geq 90\%$
Knee Outcome Survey-Activities of Daily Living scale (KOS-ADLs)	$\geq 90\%$
Global Rating score (GRS)	$\geq 90\%$



Which Tests are Most Strongly Associated with RTS

Who Passes Return-to-Sport Tests, and Which Tests Are Most Strongly Associated With Return to Play After Anterior Cruciate Ligament Reconstruction?

Kate E. Webster,^{*†} PhD, and Julian A. Feller,[‡] MB, BS(Hons)

Investigation performed at OrthoSport Victoria and La Trobe University, Melbourne, Australia

- Testing should incorporate several domains, but it is unclear which are most associated with a successful RTS
- Only 17 (3.8%) patients met all 5 test criteria at 6 months, and 95 (21%) patients did not pass any test
- The level of sport the patient played before injury (level I vs level II/III) was not associated with the number of tests
- Testing at 6 months is not worthwhile

Return to Sport Following ACL Reconstruction

Sports Medicine

<https://doi.org/10.1007/s40279-019-01093-x>

SYSTEMATIC REVIEW

Sports Medicine

<https://doi.org/10.1007/s40279-019-01093-x>

What is the Evidence for and Validity of Return-to-Sport Testing after Anterior Cruciate Ligament Reconstruction Surgery? A Systematic Review and Meta-Analysis

Kate E. Webster¹  · Timothy E. Hewett^{2,3,4,5}

Sports Medicine, 2019

Conclusions :

- Though passing RTS criteria reduced the risk of subsequent graft rupture by 60%, it increased the risk of a contralateral ACL rupture by 235%
- Current RTS criteria do not appear to decrease the risk of subsequent ACL injury in athletes



Return to Sport Following ACL Reconstruction

Return-to-Sport Outcomes at 2 to 7 Years After Anterior Cruciate Ligament Reconstruction Surgery

Clare L. Ardern,^{*†} BPhysio(Hons), Nicholas F. Taylor,^{†‡} PhD, BAppSc(Physio), BSc, Julian A. Feller,[†] FRACS, and Kate E. Webster,[†] PhD, BSc(Hons)
Investigation performed at La Trobe University, Bundoora, Victoria, Australia

Am J Sports Med, 2012

Return to the Preinjury Level of Competitive Sport After Anterior Cruciate Ligament Reconstruction Surgery

Two-thirds of Patients Have Not Returned by 12 Months After Surgery

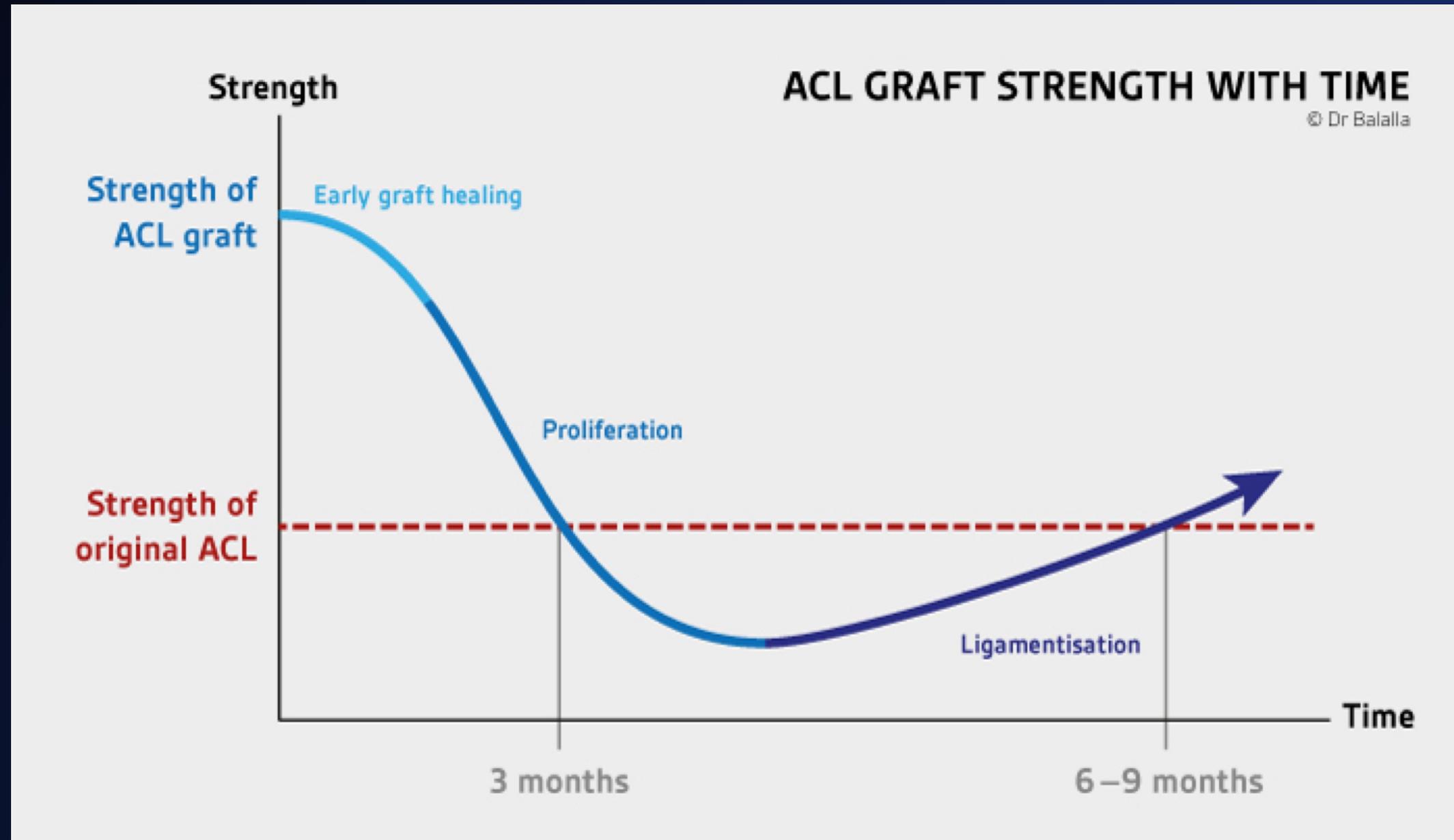
Clare L. Ardern,^{*†} PT, Kate E. Webster,[†] PhD, Nicholas F. Taylor,^{†‡} PhD, and Julian A. Feller,[†] FRACS
Investigation performed at the Musculoskeletal Research Centre, La Trobe University, Bundoora, Victoria, Australia

Am J Sports Med, 2011

- 82% returned to some kind of sports participation (93%)
- 63% returned to their preinjury level of participation (61%)
- 44% returned to competitive sport (41%)

Fear of reinjury most commonly cited reason for a reduction in cessation or sports participation

ACL Graft Healing Time



Contributing Factors

- Time since surgery
- Type of sport
- Level of competition
- Athlete age
- Number of tests failed
- Reasons for failure
- Previous / associated injuries

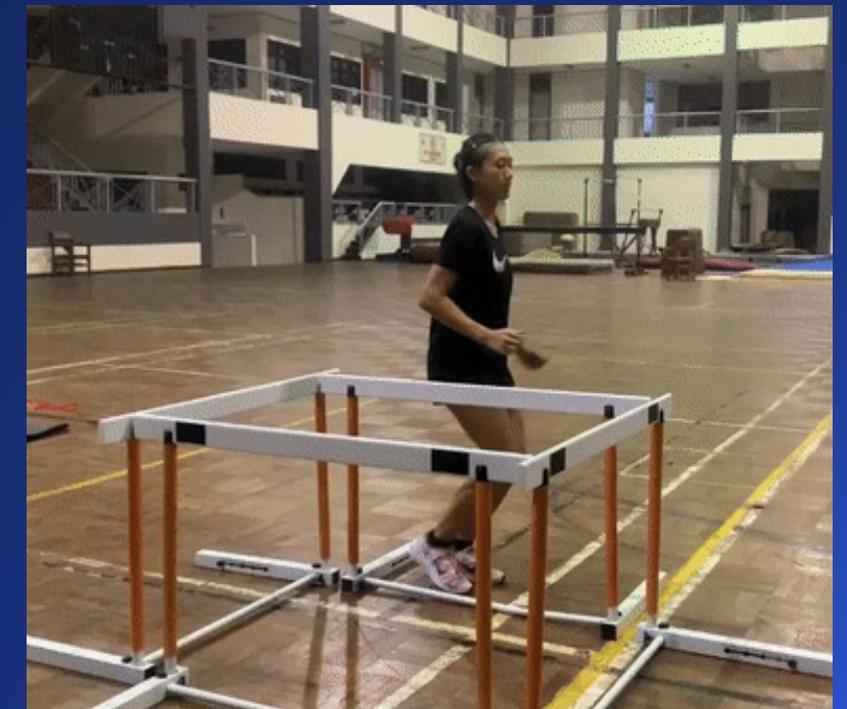


Shalika Aurelia

Factors Affecting RTS Decision

“Return-to-Play in Sport: A Decision-based Model”....

- Medical Factors
- Sport Risk Modifiers
- Decision Modifiers



RTS & MRI for ACLR

AAA 2016 International Meeting

ACL Revision: Clinical Evaluation, Magnetic Resonance and Return to Sports one Year after Surgery.

Matias Costa-Paz, M.D., Julieta Puig Dubois, M.D., Juan Pablo Zicaro M.D., Alejandro Rasumoff M.D., and Carlos Yacuzzi M.D.¹

¹Hospital Italiano de Buenos Aires, Argentina

Conclusion :

- Despite satisfactory clinical evaluation, **only 44% patients RTS** at previous level of sport activity post ACLR
- Ligamentation process was found in 28% of evaluated knees with MRI one year later
- Partial osteointegration is inferred in 44%

MRI is useful too to consider the RTS one year post ACLR

Psychological Readiness ?

How Much Do Psychological Factors Affect Lack of Return to Play After Anterior Cruciate Ligament Reconstruction?

A Systematic Review

Benedict U. Nwachukwu,^{*†} MD, MBA, Joshua Adjei,[†] MD, Ryan C. Rauck,[†] MD, Jorge Chahla,[‡] MD, PhD, Kelechi R. Okoroha,[‡] MD, Nikhil N. Verma,[‡] MD, Answorth A. Allen,[†] MD, and Riley J. Williams III,[†] MD

Investigation performed at the Hospital for Special Surgery, New York, New York, USA

Factors Associated With Psychological Readiness to Return to Sport After Anterior Cruciate Ligament Reconstruction Surgery

Kate E. Webster,^{*†} PhD, Christopher V. Nagelli,[‡] PhD, Timothy E. Hewett,^{‡§¶} PhD, and Julian A. Feller,[#] FRACS

Investigation performed at OrthoSport Victoria and La Trobe University, Melbourne, Australia

Psychology and sport injury

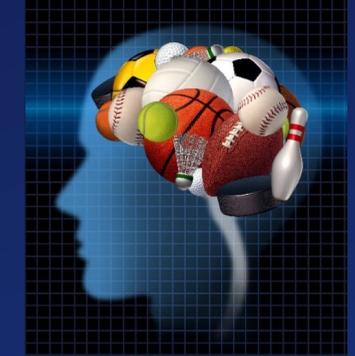
Psychological response to injury continues long after the injury has occurred



Effect on rehabilitation and return to sport outcomes

Psychological Readiness ?

ACL Return to Sport after Injury (ACL-RSI)



Construct

Example Questions

Emotions

Are you nervous about playing your sport ?

Do you find it frustrating to have to consider your knee with respect to your sport ?

Are you fearful of reinjuring your knee by playing your sport ?

Confidence in Performance

Are you confident that you could play your sport without concern for your knee ?

Are you confident that you can perform at your previous level of sport participation ?

Risk Appraisal

Do you think you are likely to reinjure your knee by participating in your sport ?



Expectations for Return to Preinjury

Expectations for Return to Preinjury Sport Before and After Anterior Cruciate Ligament Reconstruction

Kate E. Webster,^{*†} PhD, and Julian A. Feller,[‡] FRACS

Investigation performed at OrthoSport Victoria and La Trobe University, Melbourne, Australia

AJSM, 2019

Conclusions :

- Athletes have high expectations for pre-injury level of sports when undergoing initial ACLR
- Female patients & patients who had undergone previous ACLR more likely to change their expectation & cease sport participation
- **Should provide athletes with realistic RTS expectations** in the 1st post-op year

Delayed Return to Sport

Return to the Preinjury Level of Competitive Sport After Anterior Cruciate Ligament Reconstruction Surgery

Two-thirds of Patients Have Not Returned by 12 Months After Surgery

Clare L. Ardern,^{*†} PT, Kate E. Webster,[†] PhD, Nicholas F. Taylor,^{††} PhD, and Julian A. Feller,[†] FRACS
Investigation performed at the Musculoskeletal Research Centre, La Trobe University, Bundoora, Victoria, Australia

Am J Sports Med, 2011

Should return to sport be delayed until two years after anterior cruciate ligament reconstruction? Biological and functional considerations

Christopher V. Nagelli^{1,2,4,5} and Timothy E. Hewett^{1,2,3,4,5}

¹Orthopedic Biomechanics Laboratories, Mayo Clinic, Rochester, MN

²Department of Orthopedic Surgery and Sports Medicine Center, Mayo Clinic, Rochester, MN

³Department of Physical Medicine and Rehabilitation, Mayo Clinic, Rochester, MN

⁴Department of Biomedical Engineering, The Ohio State University, Columbus, OH

Sports Med, 2017

2/3 Have Not Returned by 12 Months After Surgery

Conclusion :

Delay in RTS for nearly 2 years will significantly reduce the incidence of second ACL injuries

Take Home Messages

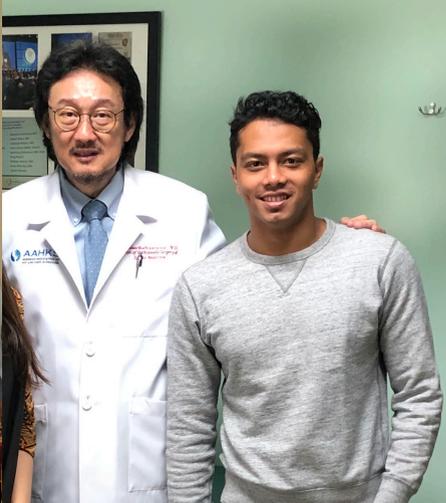
- Growing evidence that return-to-play decisions should be multidisciplinary and criteria-based in nature and consider a multitude of factors
- Return to sport rates are lower than anticipated from standard outcome measures
- Multifactorial
- Age is important
- Psychological factors may need to be considered in future research



Larry Johnson
2x NBA All Star



Chris John
16x WBA
Champion



I Gede Siman Sudartawa
Gold Medalist for 8 SEA
Games



Marcus Gideon
Badminton World Champion



Alwi Farhan
BWF Junior World
Champion 2023



Greysia & Apriani
Gold Medalists for
Tokyo Olympics 2020



Shaquille O'Neal
15x NBA All Star



ASIAN GAMES
2018

Thank You For Your Attention



Yao Ming
8x NBA All Star