Sports Medicine: Then and Now

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LECOM Health Orthopedic and Sports Medicine
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The presenter has no relevant financial relationships to be discussed, directly or indirectly, referred to or illustrated with or without recognition within this presentation.

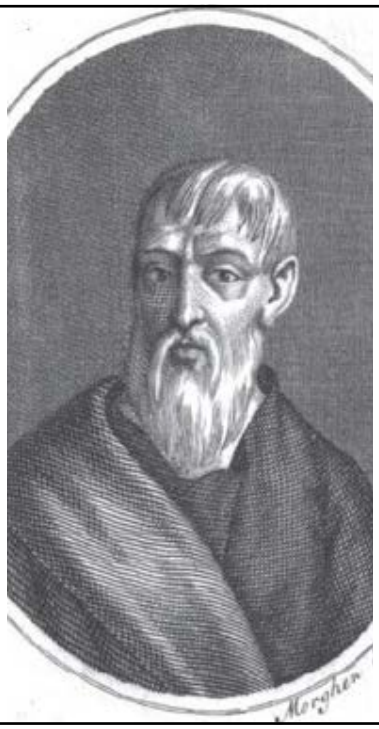
Participants will improve their understanding of the history of sports medicine, as well as basic arthroscopy and its application to conditions about the shoulder, knee and hip, including indications, contraindications, anatomy, and most common arthroscopic procedures.

Participants will be lectured on and expected to be able to:

- Discuss the history of sports medicine and arthroscopy.
- Describe the origins of arthroscopy and its current most common applications in the shoulder, knee and hip.
- Discuss the concept of triangulation, as well as the various angle types of arthroscopes and indications for each.
- Identify common arthroscopic anatomy within the shoulder, knee and hip.
- Explain the arthroscopic treatment options for the most commonly encountered conditions in arthroscopy of the shoulder, knee and hip.

Ancient Sports Medicine

- Panhellenic Games - First recorded "friendly" competition (776 BCE)
  - Olympic Games, Pythian Games, Nemean Games, Isthmian Games
  - *Gymnastes* – early athletic trainers
    - Base knowledge of diet, anatomy, and physiology



Ancient Sports Medicine

- **Herodicus** – Greek physician of 5th century BC
  - Considered the "**Father of Sports Medicine**"
  - First documented use of therapeutic exercise as treatment of disease and health maintenance
  - Bad health – imbalance between diet and physical activity
  - Tutored Hippocrates

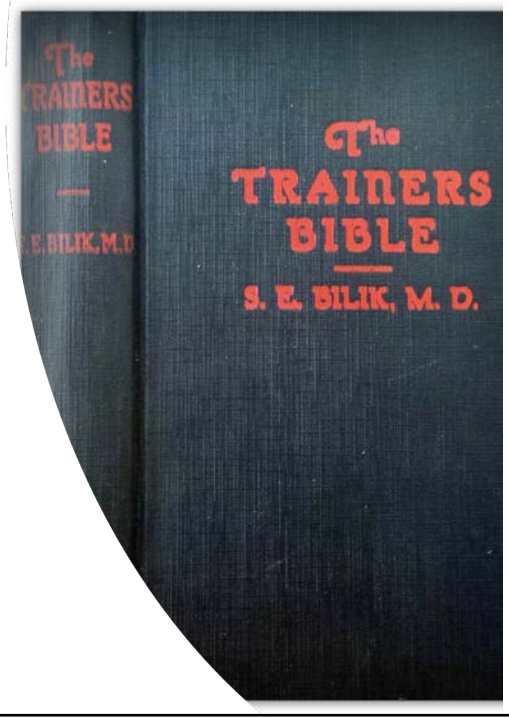
Ancient Sports Medicine

- Claudius Galen of Pergamum - a 100 A.D. Greek surgeon
  - Physician to Gladiators
  - Developed first surgery to remove arrows
  - Taught trainers and improved techniques to improve athlete's strength

- 1912 – Oberhof, Germany – First German Congress for Scientific Investigation of Sports and
- Physical Education
  - Leading to the AIMS (Internationale Medico-Sportive)

Modern Sports Medicine

- 1917 – Dr. S.E. Bilik
  - Writes first major text on athletic training and care of athletic injuries



Modern Sports Medicine

- February 14, 1928 – 11 physicians found the Association Internationale Medico-Sportive (AIMS)
  - During the Winter Olympics in St. Moritz, Switzerland

Modern Sports Medicine

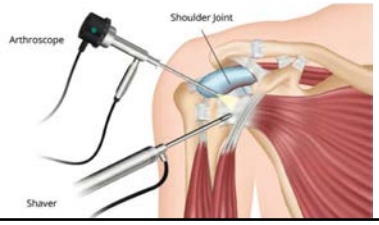
Cramer Family (1920's -Kansas)

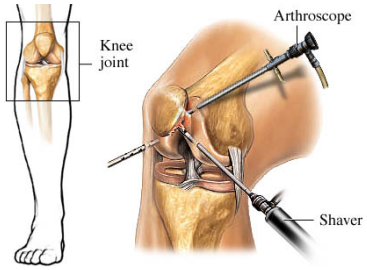
- Start chemical company - begin to produce first liniment to treat ankle sprains.
- Publishes *First Aider* – 1932 – newsletter discussing athletic training.

The Birth of Modern Orthopedic Sports Medicine: Arthroscopy

- A surgical procedure to visualize, diagnose, and treat problems within a joint

- **"arthro" = joint**
- **"skopein" = to look**





History of Arthroscopy

- Severin Nordentoft – 1912
  - presented the use of his 5mm "trokart-endoscope" into the knee joint for early detection of meniscal lesions
  - **Presented to the 41st Congress of the German Society of Surgeons at Berlin**
  - **Did not express clearly if he performed on patients or cadaver knees – no follow up**

History of Arthroscopy

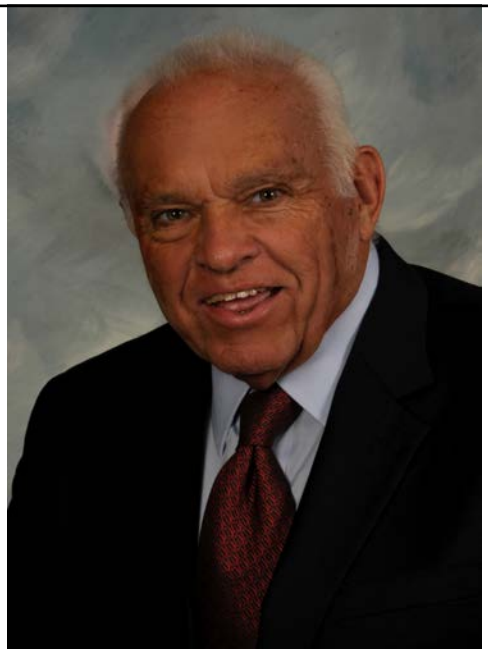
- Prof. Kenji Takagi – 1919
  - **"Father of Arthroscopy"**
  - Used a 7.3mm cystoscope for first arthroscopies
    - Developed 12 scopes with different diameters and angles
  - Distended the knee joint with saline for easier examination

History of Arthroscopy

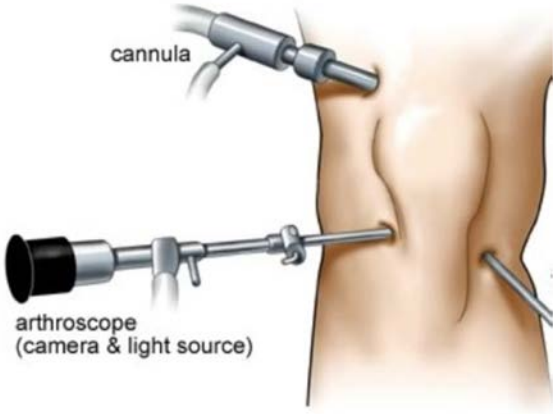
- **Masaki Watanabe** – 1955 - first recorded arthroscopic intervention - removal of giant cell tumor
  - Trained under Dr. Takagi – revolutionized arthroscopy as a therapeutic procedure.
    - **Developed concept of "triangulation" with multiple portals**
    - **1962 – first recorded partial medial menisectomy**

History of Arthroscopy

- 1965 – Robert Jackson MD
  - trains under Watanabe
    - **1968 – gives first of 7 annual instructional courses at American Academy of Orthopaedic Surgeons (AAOS)**
    - **1976 – publishes first text book in English for arthroscopy of the knee**



Lanny Johnson, M.D.



Arthroscopy Basics
The Scope & Optical Characteristics

Diameter - 1.9mm, 2.7 mm, 4.0 mm

Angle of Inclination – angle between axis of arthroscope and a line perpendicular to the surface of the lens (0 to 120 degrees). 30 and 70 most common.

Field of view - viewing angle encompassed by the lens and varies according to the type of arthroscope. Greater angle = larger central blind spot.

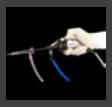
Arthroscopy Basics
The Television Camera

Allows image transmission from scope to monitor.

Advantages : comfortable

avoidance of contamination

involvement of rest of surgical team



Arthroscopy Basics Irrigation / Pump

-At least 2 - 5-L bags of LR, w/ or w/o epi (1mg/Lt of fluid).

-Gravity - each foot of elevation of fluid above joint = 22 mm Hg of pressure

-Inflow Pump - Varies by joint, but can set to approx 30 mm Hg below the systolic BP.

-Monitor for extavasation.

Arthroscopy Basics Accessories

-Arthroscopes (30- and 70-degree)

-Probe

-Scissors

-Cannula(s)
-Basket forceps

-Grasping forceps

-Arthroscopic knives

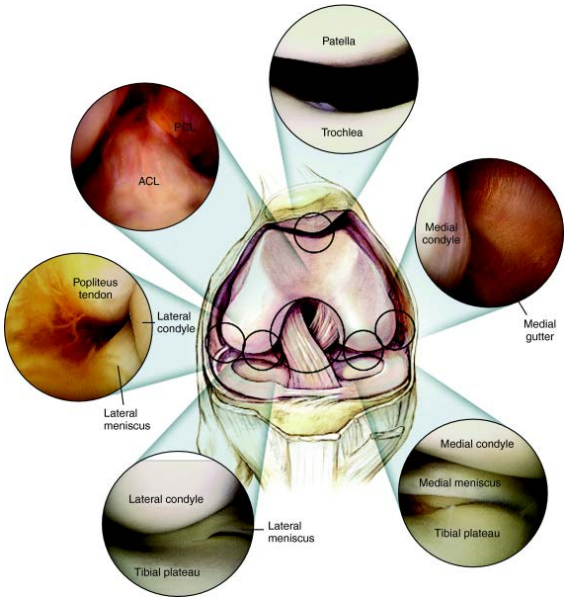
-Motorized shaver

-Electrocautery or radiofrequency

device

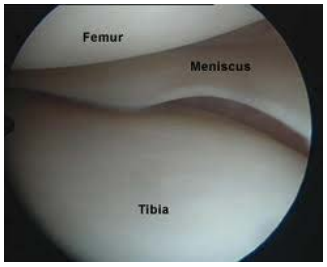
Complications (overall <1%)
-Hemarthrosis
-Infection
-Thromboembolic dz
-Anesthesia complications
-Instrument failure
-Ligament injury
-Fracture
-Neurological / vascular injury
-Arthrofibrosis

Arthroscopy of the Knee



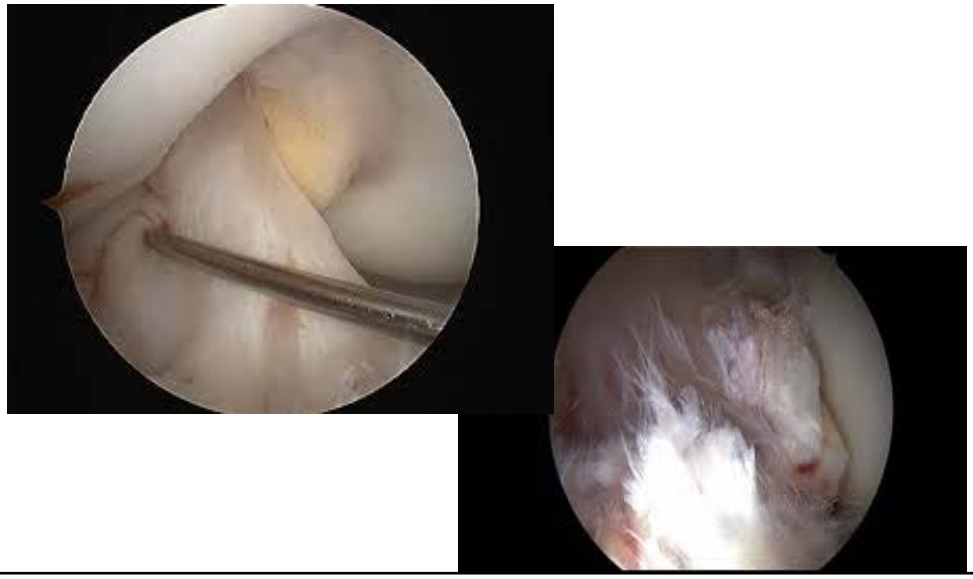
Meniscus Tears Treatment

- Most radial, flap, complex and degenerative tears are best treated by partial meniscectomy.
- Repair reserved for longitudinal tears in the red or red-white zone, in young (no DJD) pt.s.



Meniscus Pathology

Anterior Cruciate Ligament



History of ACL

- Claudius Galen – first to describe ACL
  - as ligament – "*genu cruciata*"
- 1836 – Weber brothers (Germany) – described abnormal A-P movement after transection
  - Also described each bundle and mechanism

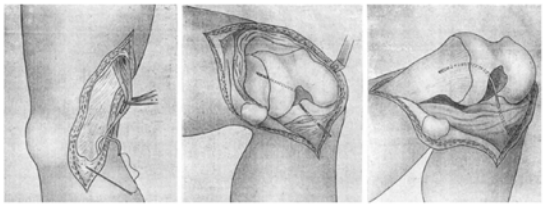
Operative Treatment of ACL Tear

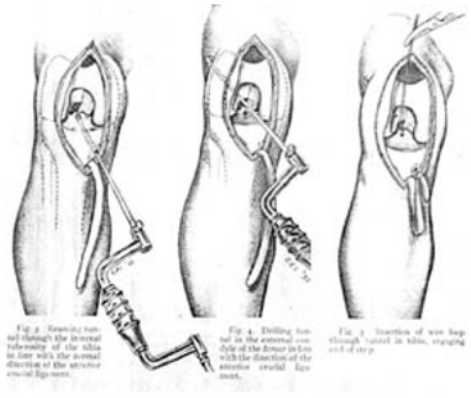
- 1900 – British surgeon W.H. Battle publishes report of successful repair of ACL
  - **1903 – Sir Arthur Mayo-Robson**
    - **publishes 8 year follow up on a simple surgical repair 1895**

Operative Treatment of ACL Tear

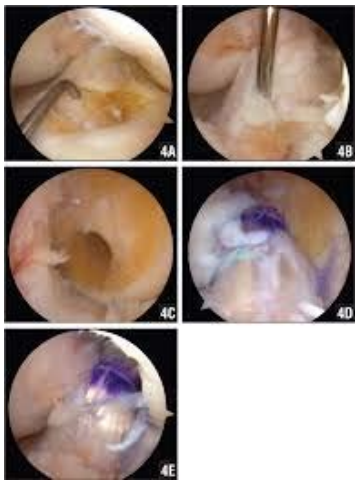
- 1913 - Knut Harald Giertz – Swedish surgeon
  - 13 y/o girl – lost cruciates to septic arthritis
  - Augmented both ACL and PCL with fascia lata
  - **1917 – Ernest Hey Groves – German surgeon**
    - **Described technique using a strip of IT band through bone tunnels as new ligaments**

- 1934 – Riccardo Galeazzi (Italy)
  - Describes ACL reconstruction with semitendinosus tendon





ACL Reconstruction



Chondral Injuries

Outerbridge Classification of Arthritis Of Articular Cartilage

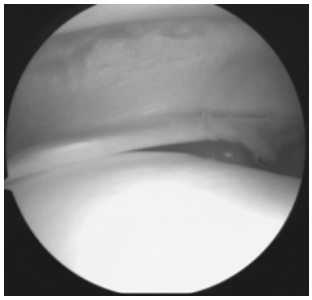
Grade 0	Normal cartilage
Grade I	Cartilage with softening and swelling
Grade II	Partial-thickness defect with fissures on the surface that do not reach subchondral bone or exceed 1.5 cm in diameter
Grade III	Fissuring to the level of subchondral bone in an area with a diameter more than 1.5 cm
Grade IV	Exposed subchondral bone

Pathologic Synovial Plica

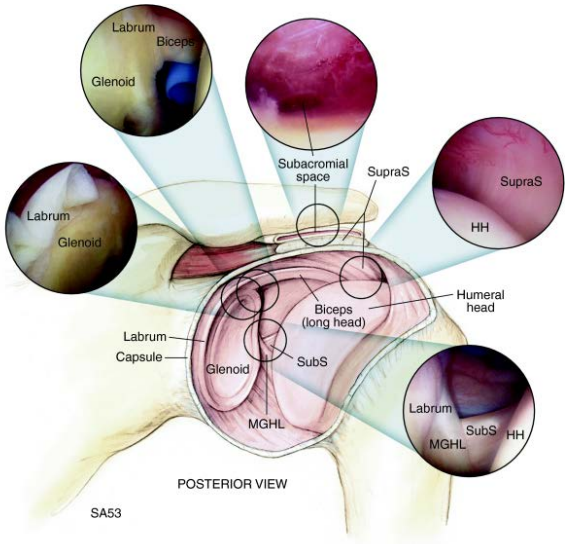
-Present in most knees as a redundant synovial fold, but can become pathologic (plica syndrome), from inflammation, thickening and irritation.

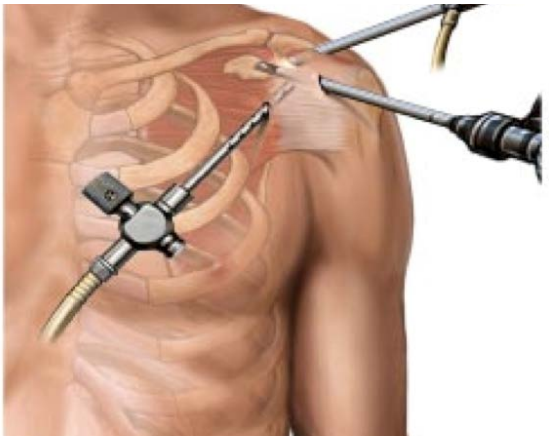
-Spans from genu articularis, coursing over far medial aspect of MFC to attach to distomedial aspect of the intraarticular synovial lining.

-Can be debrided / resected arthroscopically if symptomatic.

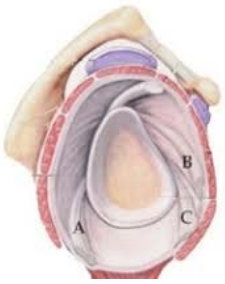


Standard Arthroscopic Shoulder Examination

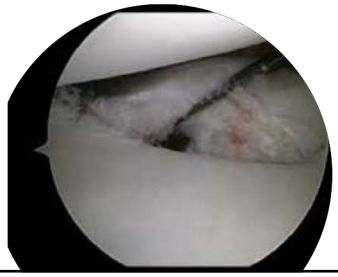




The Glenoid Labrum



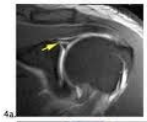
Bankart Lesion

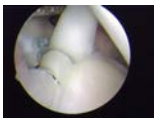


-Disruption of anteroinferior labrum / capsule

-Assoc. w/ anterior GH dislocations.

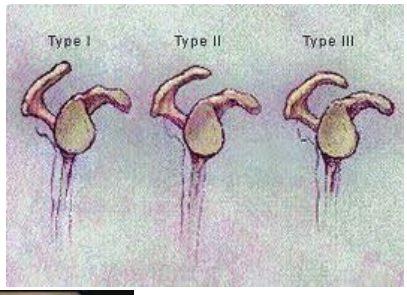
-Considered "lesion of necessity"



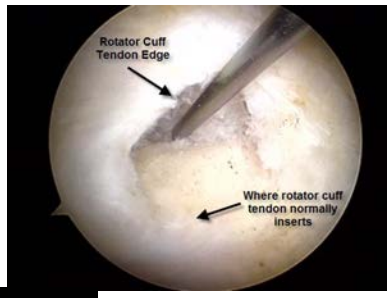


SLAP Lesions

Subacromial Impingement & Decompression



Rotator Cuff Repair



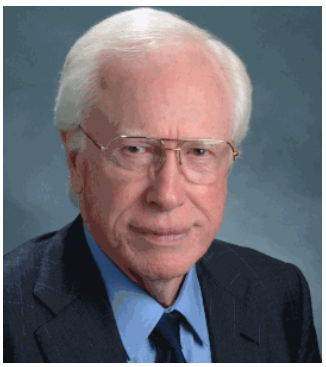
Modern Arthroscopy = The Athlete's Surgeon

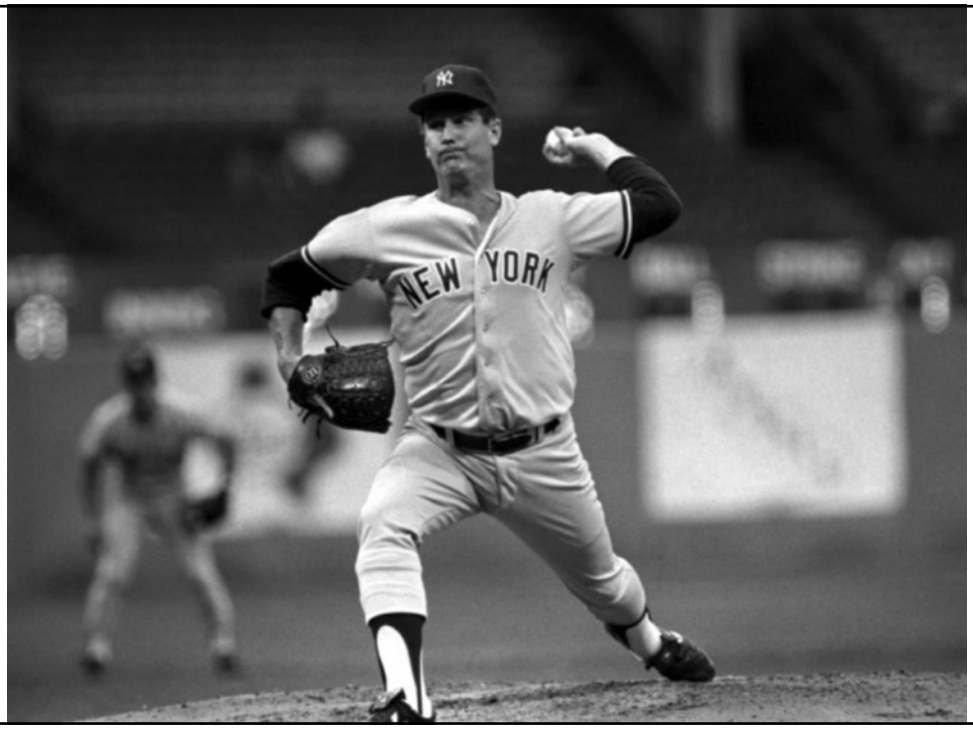
Leading sports medicine surgeon for knee, elbow, and shoulder injuries

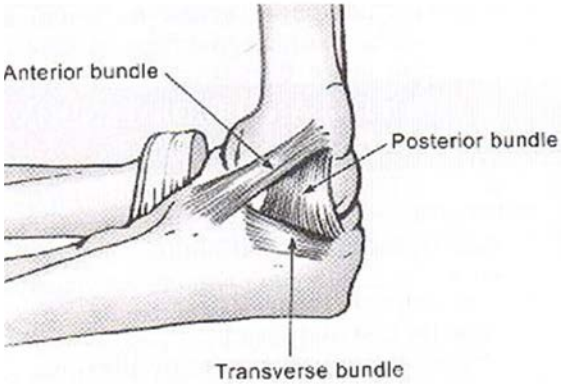
- Founder of American Sports Medicine Institute
- Serves as team doctor for Auburn, Alabama, Rays and Washington Redskins

Dr. Frank Jobe
Tommy John Surgery

- First performed in 1974 by Dr. Frank Jobe
- Eponym for ulnar collateral ligament reconstruction



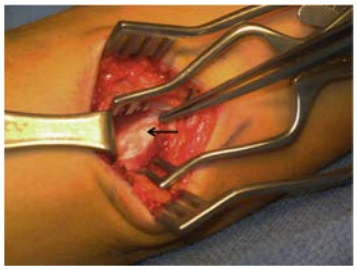


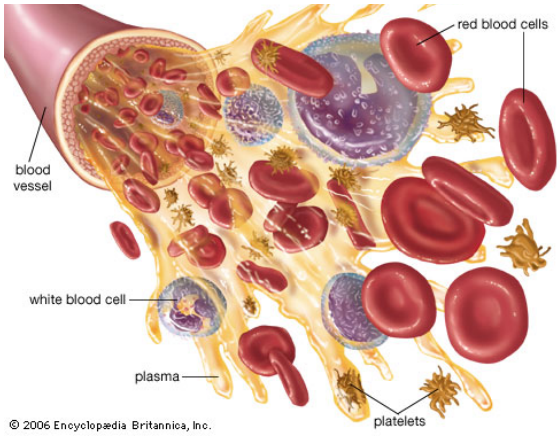


Tommy John Surgery

- Anterior band reconstruction – using tendon autograft or allograft.
  - Palmaris longus, gracilis, semi-tendinosis, plantaris, patellar

- **9-12 months return to competitive throwing**
- **90% return to pre-injury levels of throwing**




red blood cells
blood vessel
white blood cell
plasma
platelets
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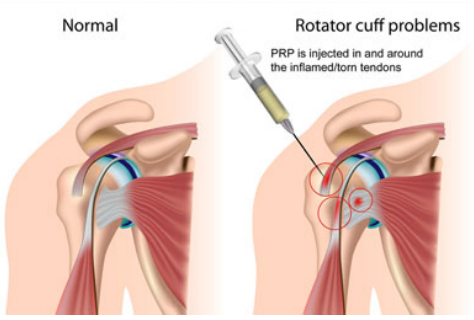
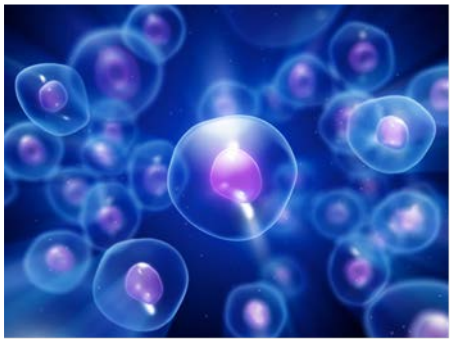
PROCESS OF PRP THERAPY
1
2
3
Collect blood
30-60ml of blood is drawn from the patient's arm.
Separate the platelets
The blood is then placed in a centrifuge. The centrifuge spins and separates the platelets from the rest of the blood components.
Extract platelet-rich plasma
Extract 3-6ml of platelet-rich plasma.



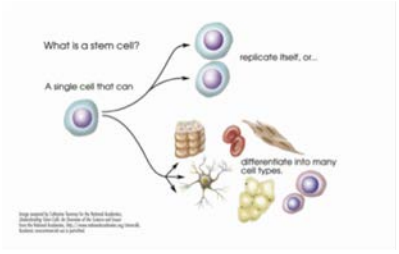
- Controversially used for possible stimulation of bone and soft tissue healing
- Used for osteoarthritis, fracture healing, soft tissue injury healing, ACL/ligaments, meniscus repair, rotator cuff repair, tendon repair
  - NO CONSENSUS on efficacy, minimal level 1 evidence-based support on benefit.
  - Reports only on potential benefit.



Regenerative Therapy

- Therapy using stem cells to potentially accelerate healing, repairing damaged tissues, improve pain and function

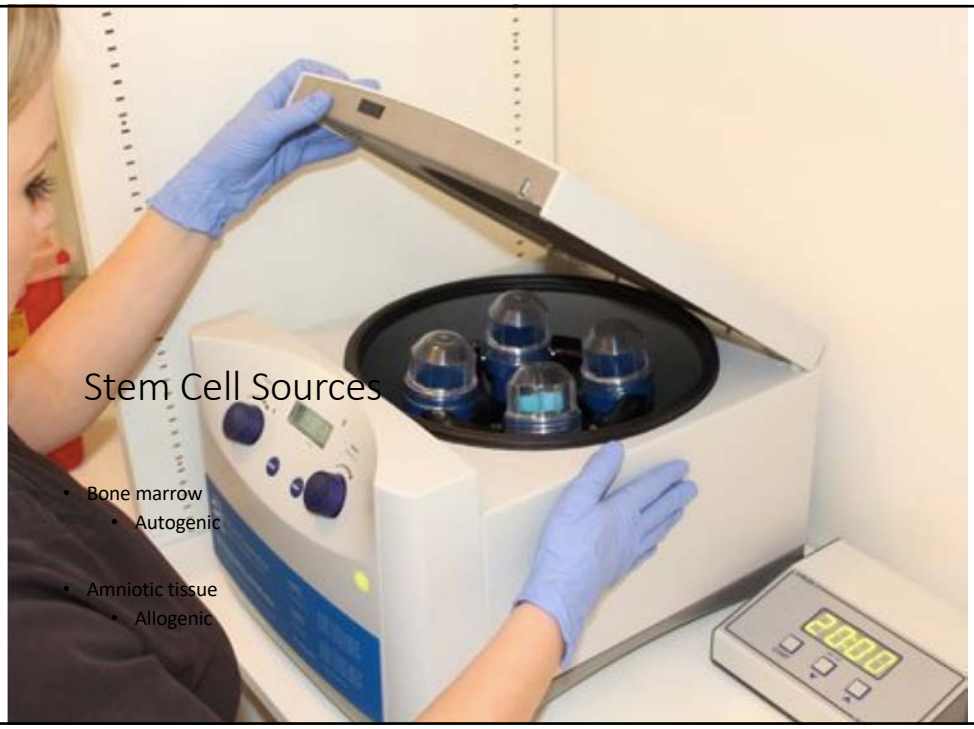
- **Stem cells are basic human cells before differentiation = undifferentiated cells**



Stem Cell Therapy

Undifferentiated cells can help create new cells in existing tissues to help repair

- Tendon injuries (Achilles tendon, Jumper's knee, Tennis elbow, Golf elbow)
- Plantar fascitis
- Ligament sprains
- Arthritis
- Meniscal injuries



Stem Cell Sources

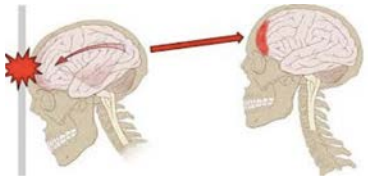
- Bone marrow
  - Autogenic
- Amniotic tissue
  - Allogenic

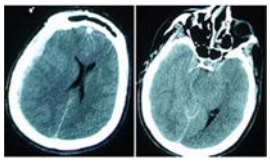
- Currently performed at research centers as part of controlled trials
  - Regenerate articular cartilage
  - Heal ligaments/tendons
  - Promote healing of bone fractures
- Future experimental phases for:
  - Diabetes, Alzheimer's disease, muscle disorders (dystrophies), multiple sclerosis, etc.

Viscosupplementation

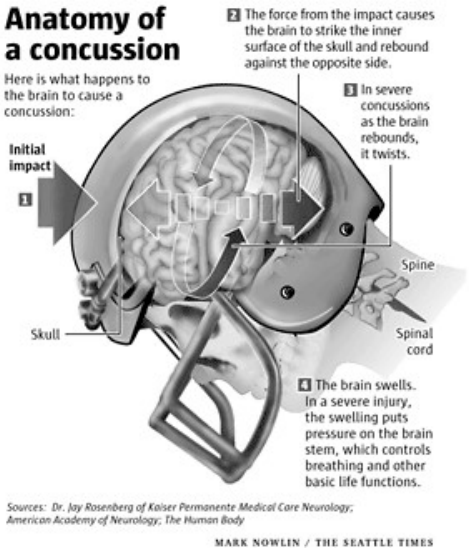
- Knee joint fluid = hyaluronic acid
- Hyaluronic acid is a mucopolysaccaharide
  - Carbohydrate

- **As we age, viscosity in joints decrease**
  - **Decreasing hyaluronic acid content**
  - **Therapeutic use is controversial**





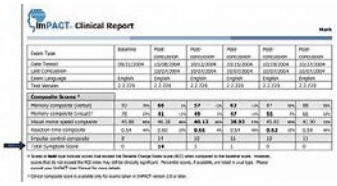
Concussion

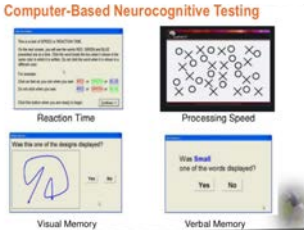

Anatomy of a concussion
Here is what happens to the brain to cause a concussion:
Initial impact
1
2 The force from the impact causes the brain to strike the inner surface of the skull and rebound against the opposite side.
3 In severe concussions as the brain rebounds, it twists.
Spine
Skull
Spinal cord
4 The brain swells. In a severe injury, the swelling puts pressure on the brain stem, which controls breathing and other basic life functions.
Sources: Dr. Jay Rosenberg of Kaiser Permanente Medical Care Neurology; American Academy of Neurology; The Human Body
MARK NOWLIN / THE SEATTLE TIMES

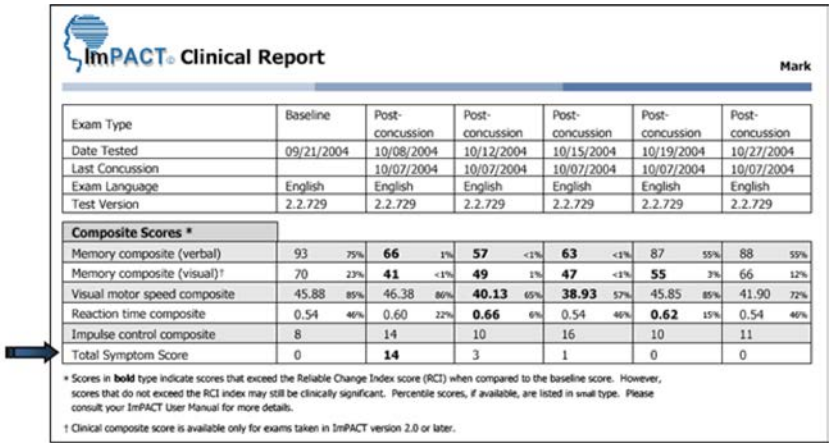
- Common symptoms headache and dizziness
  - Can have amnesia
- CT are usually normal
- Evaluation
  - Memory tests
  - Balance Error Scoring System (BESS)
  - Standard Assessment of Concussion Test (SAC)
  - Immediate Post-Concussion Assessment and Cognitive Testing battery (ImPACT)

ImPACT

- Computer based tool developed at University of Pittsburgh Medical Center – Center for Sports Medicine
- Evaluates multiple aspects of neurocognitive function: memory, processing speed, reaction time, post-concussive symptoms







ImPACT® Clinical Report

Mark

Exam Type	Baseline	Post-concussion	Post-concussion	Post-concussion	Post-concussion	Post-concussion
Date Tested	09/21/2004	10/08/2004	10/12/2004	10/15/2004	10/19/2004	10/27/2004
Last Concussion		10/07/2004	10/07/2004	10/07/2004	10/07/2004	10/07/2004
Exam Language	English	English	English	English	English	English
Test Version	2.2.729	2.2.729	2.2.729	2.2.729	2.2.729	2.2.729

Composite Scores *												
Memory composite (verbal)	93	75%	**66**	1%	**57**	<1%	**63**	<1%	87	55%	88	55%
Memory composite (visual)†	70	23%	**41**	<1%	**49**	1%	**47**	<1%	**55**	3%	66	12%
Visual motor speed composite	45.88	85%	46.38	86%	**40.13**	65%	**38.93**	57%	45.85	85%	41.90	72%
Reaction time composite	0.54	46%	0.60	22%	**0.66**	6%	0.54	46%	**0.62**	15%	0.54	46%
Impulse control composite	8		14		10		16		10		11	
Total Symptom Score	0		**14**		3		1		0		0	

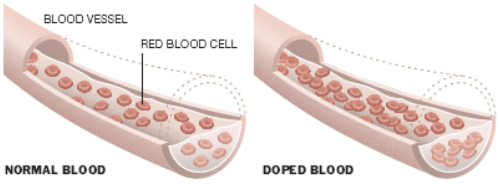
* Scores in **bold** type indicate scores that exceed the Reliable Change Index score (RCI) when compared to the baseline score. However, scores that do not exceed the RCI index may still be clinically significant. Percentile scores, if available, are listed in small type. Please consult your ImPACT User Manual for more details.

† Clinical composite score is available only for exams taken in ImPACT version 2.0 or later.

Concussion Complications

- Second impact syndrome
  - Second blow soon after initial injury
  - 50% mortality rate
  - Due to loss of autoregulation of blood supply to brain
- Post-concussive symptoms
  - Headache, confusion
- Chronic Traumatic Encephalopathy (CTE)
  - Progressive degenerative disease in patient with repeated concussions - controversial

Current Controversies in Sports Medicine



NORMAL BLOOD

The blood of a typical adult male is made up of 40 to 50 percent red blood cells, which carry oxygen to tissues. Typical levels for women are 35 to 45 percent.

DOPED BLOOD

Red blood cells (from a donor or previously removed from the athlete) or the hormone erythropoietin (EPO) are injected. The increase in red cells allows muscles to work longer and harder without cramping.

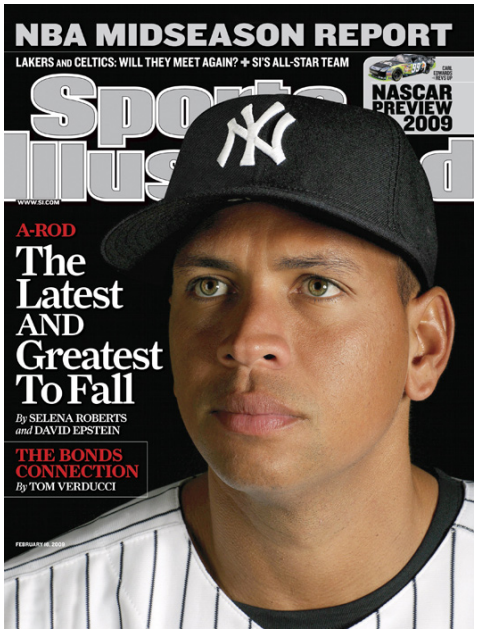
Sources: Harrison's Principles of Internal Medicine; Quest Diagnostic Laboratories

Blood Doping

- Types:
  - Blood Transfusion
    - Blood removed earlier, given before performance
  - Erythropoietin (EPO)
    - Hormone produced by kidneys – increase production of RBCs
  - Artificial oxygen carriers
    - Artificial blood

Blood Doping

- Increased RBCs/oxygen carriers causes increased oxygen to the muscles
  - Increased performance
- Risks:
  - Increased blood viscosity
    - Can lead to stroke or myocardial infarction
    - Banned by most professional athletic and competitive sports associations



- Anabolic steroids – increase muscle mass and strength
- Types:
  - Androstenedione
    - Produced by adrenal glands and gonads
    - Directly converted to testosterone
  - DHEA (Dehydoepiandrosterone)
    - Converted into androstenedione
  - Human Growth Hormone (HGH)
    - Produced by pituitary gland

Sports Trauma Overuse Prevention (STOP) Campaign

STOP SPORTS INJURIES

STOP Sports Injuries

- Sports Trauma Overuse Prevention (STOP) Campaign
- Developed in 2007 by American Orthopaedic Society for Sports Medicine (AOSSM)
  - Includes Dr. James Andrews

STOP Sports Injuries

- Comprehensive outreach program to teach the importance of sports safety
  - Specifically relating to overuse and trauma

- **Highlights the importance of safe and smart sports playing time to increase longevity of the athlete's career**

Focuses on proper technique

Warm-up/cool downs

Pre-season physicals

EARLY Treatment of injuries

Equipment maintenance

Importance of rest

Water/nutrition

Promotes injury prevention with multiple strategies

Avoidance of over-specialization

- Typically one-year fellowship.
- Non-operative Certification: through the American Board of Internal Medicine, American Board of Emergency Medicine, American Board of Family Medicine, American Board of Pediatrics and American Osteopathic Association.
- Operative certification: American Orthopaedic Society for Sports Medicine and the American Osteopathic Association
- 184 programs across 43 states as well as DC and Puerto Rico
- 48 osteopathic orthopedic surgeons currently subspecialty certified in orthopedic sports medicine.

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Thank You!