十字韌帶病人的未來

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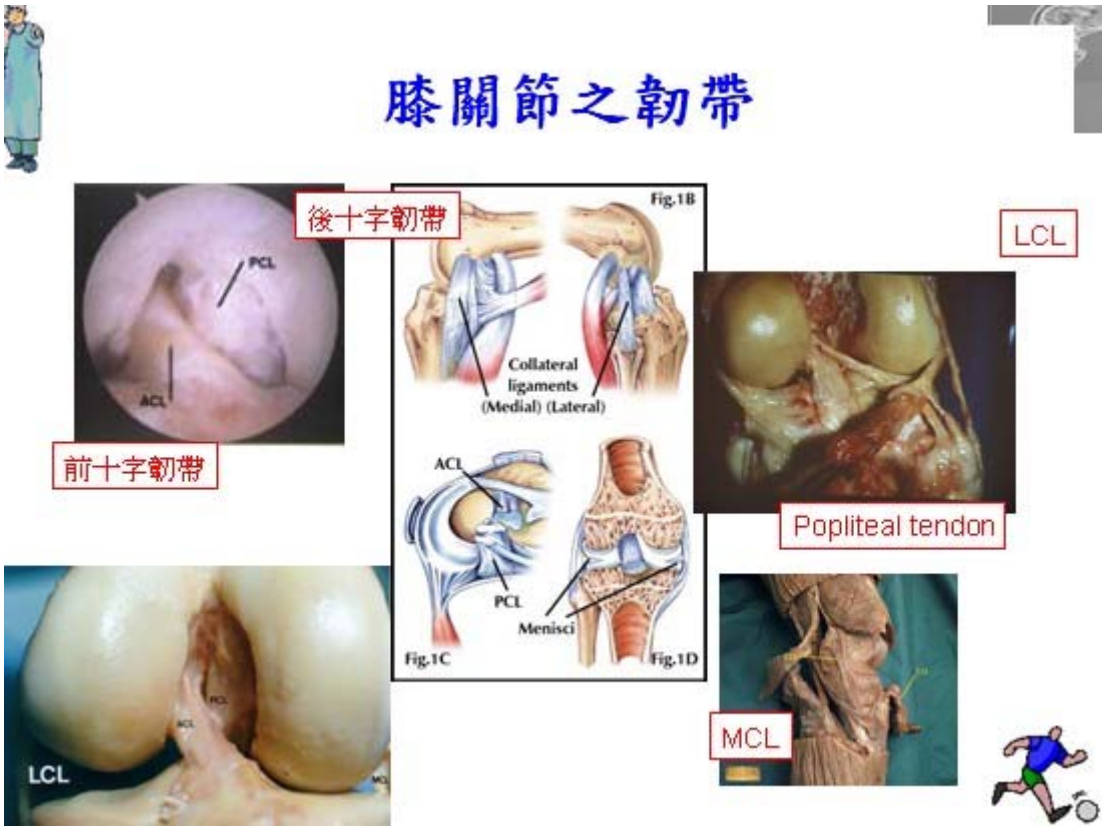
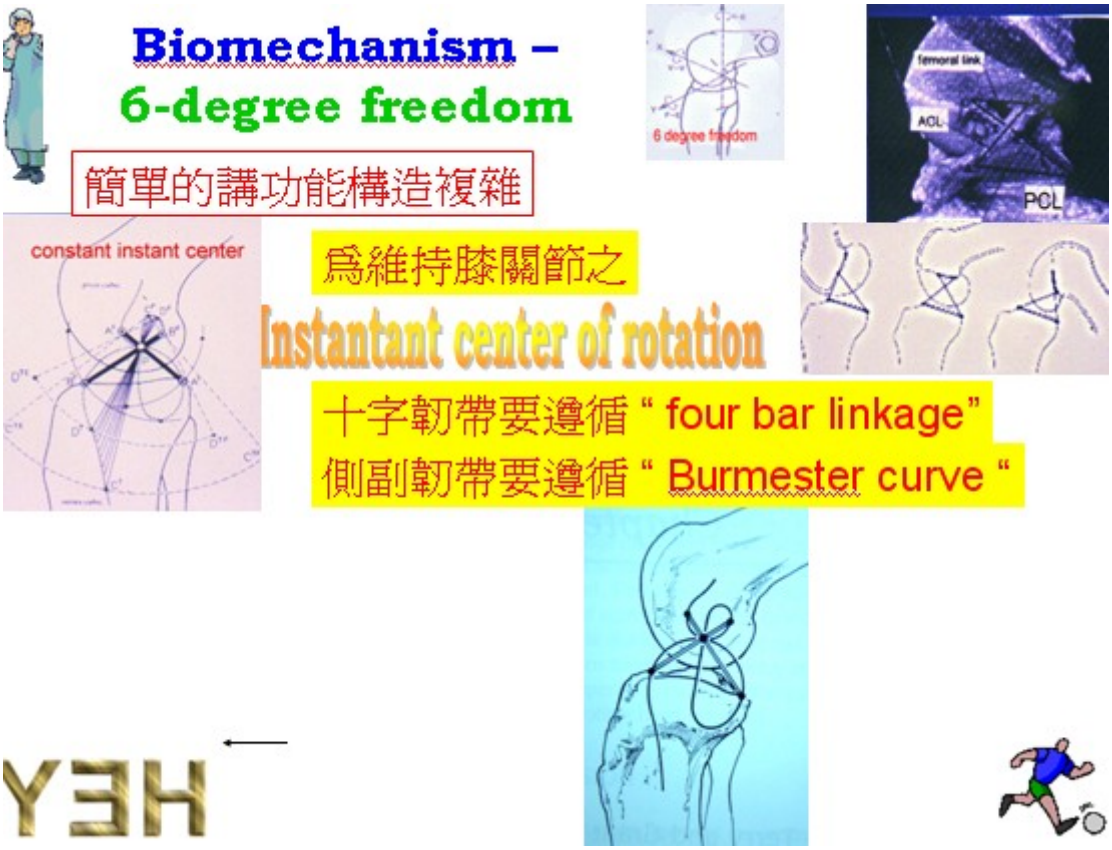




Isometry 等長?目前單股手術之準則

1 永遠有一部份韌帶有張力.
2 事實上無等張這一回事

ACL or PCL Reconstruction
以韌帶植入物取代原有韌帶
手術法爲尋找等長點 isometric point

韌帶植入物

自體
PB-T-B
Four-strand Hamstring
Quadriceps

異體
人工韌帶

老了

韌帶也跟著老
所已不足以成爲韌帶植入物

韌帶重建手術後
質變且量變
簡單的講 跟原來已完全不同
強度只剩 30-40% 且組成也不同
韌帶重建手術後

- Tendons to replace ligaments
- Does this work?
- What happens to them “biologically”?
- “Ligamentization”?

Graft biology

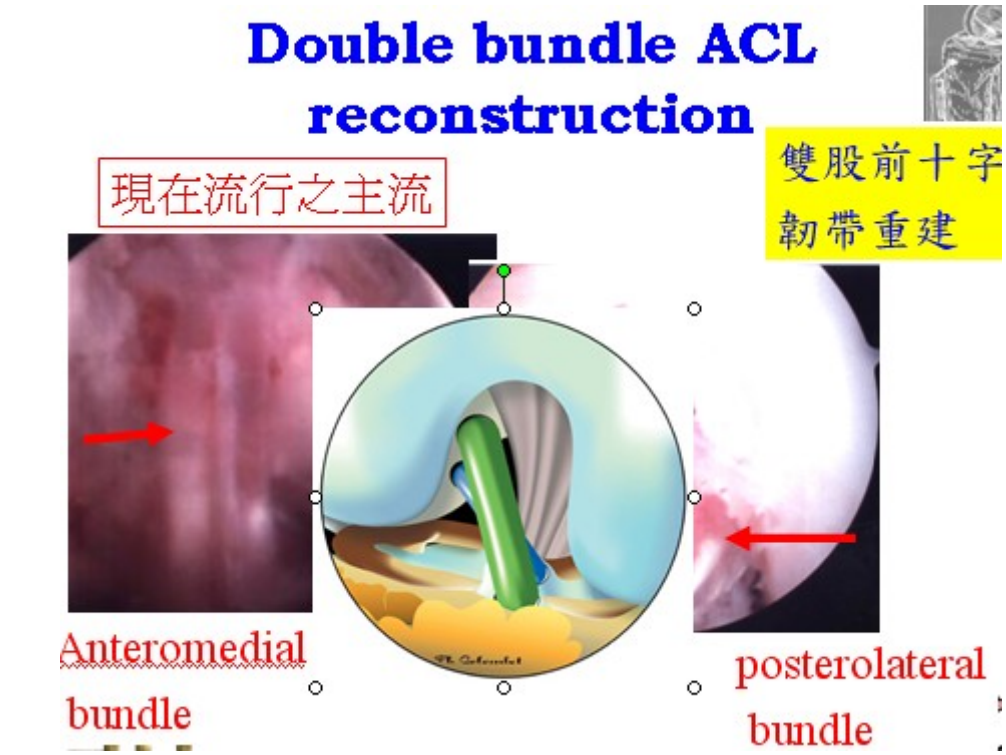
1.Revascularization
2.Repopulate with cell
3.Ligamentization ?

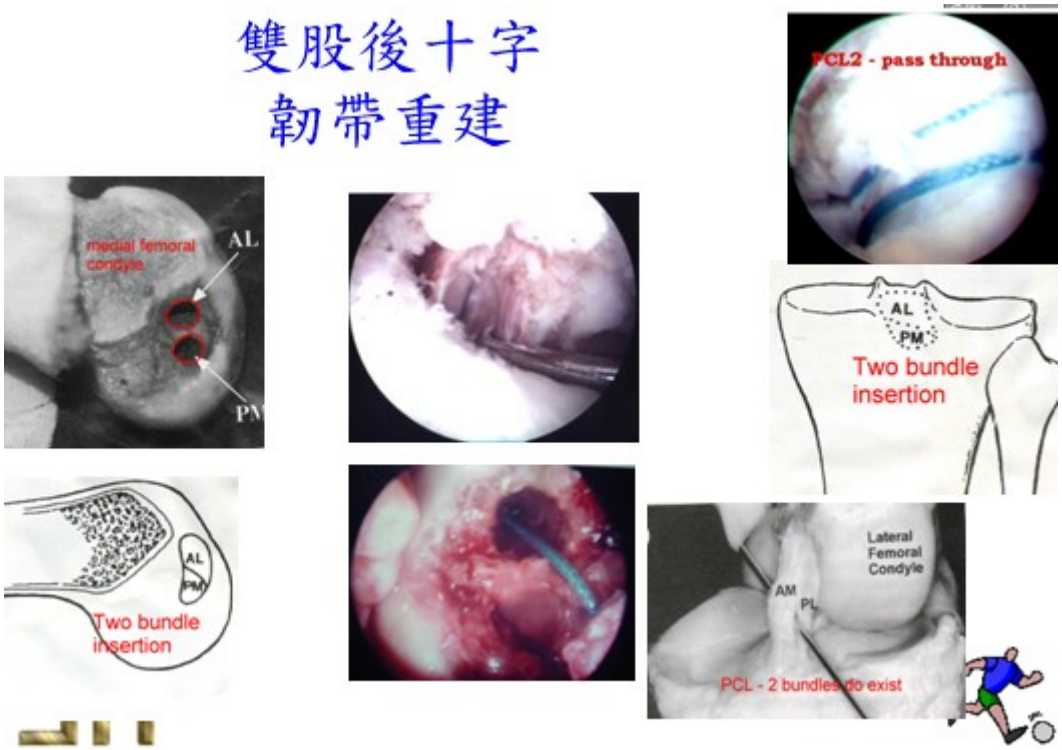
Tendon Grafts Become Scar-Like Over Time

Activities	Max Force (N)	Cycles/Yr	Cycles 59 yrs	Max Strain (%)
Ascending stairs	67	4.2×10^4	2.5×10^6	7
Ascending ramp	107	3.7×10^3	2.2×10^5	7
Descending stairs	133	3.5×10^4	2.1×10^6	7
Sitting and rising	173	7.6×10^4	4.5×10^6	
Level Walking	210	2.5×10^6	1.5×10^8	5
Descending ramp	485	3.7×10^3	2.2×10^5	7
Jogging	630	6.4×10^5	3.8×10^7	7
Jolting	700	1.8×10^3	1.1×10^5	10
TOTAL		4.4×10^6	2.9×10^8	

Adapted from Morrison 1969, Cheng and Black 1980 and Bolton and Bruchman 1984

機械及技術法


Double bundle ACL reconstruction
現在流行之主流
雙股前十字韌帶重建
Anteromedial bundle
posterolateral bundle


雙股後十字韌帶重建
PCL2 - pass through
medial femoral condyle
AL
PM
Two bundle insertion
Two bundle insertion
Lateral Femoral Condyle
AM
PL
PCL - 2 bundles do exist

Comparisons of Various Solutions

Solution	Ult. Tensile Strength (N)	Stiffness (N/mm)	Long Term Success Rate	Pros	Cons
Natural ACL (Uninjured)	2160	180	-	-	-
Autograft (Patella Tendon)	2950	2200	~70% normal after 4 years	· Early bone to bone healing · Consistent size and shape of graft	· Harvest site morbidity · Patellar Tendonitis · Loss of range of motion
Allograft (ACL)	Similar to natural ACL	Similar to natural ACL	~85% normal after 4 years	· No harvest site morbidity	· Risk of infection · Expensive
Synthetic (Gore-Tex)	4800	320	< 50% normal after 4 years	· Stronger · No harvest site morbidity · No disease transmission · Relatively easy and straightforward surgical process	· Creep · Poor long-term results · Expensive · Increased risk of late infections · Material gets worn, leading to inflammations
Synthetic (Dacron)	3600	420	~43% normal after 5 years		
Tissue Scaffolding	2000	280	~50% after normal 5 years	· No addition of cells or growth factors	· Fibers get worn · Creep

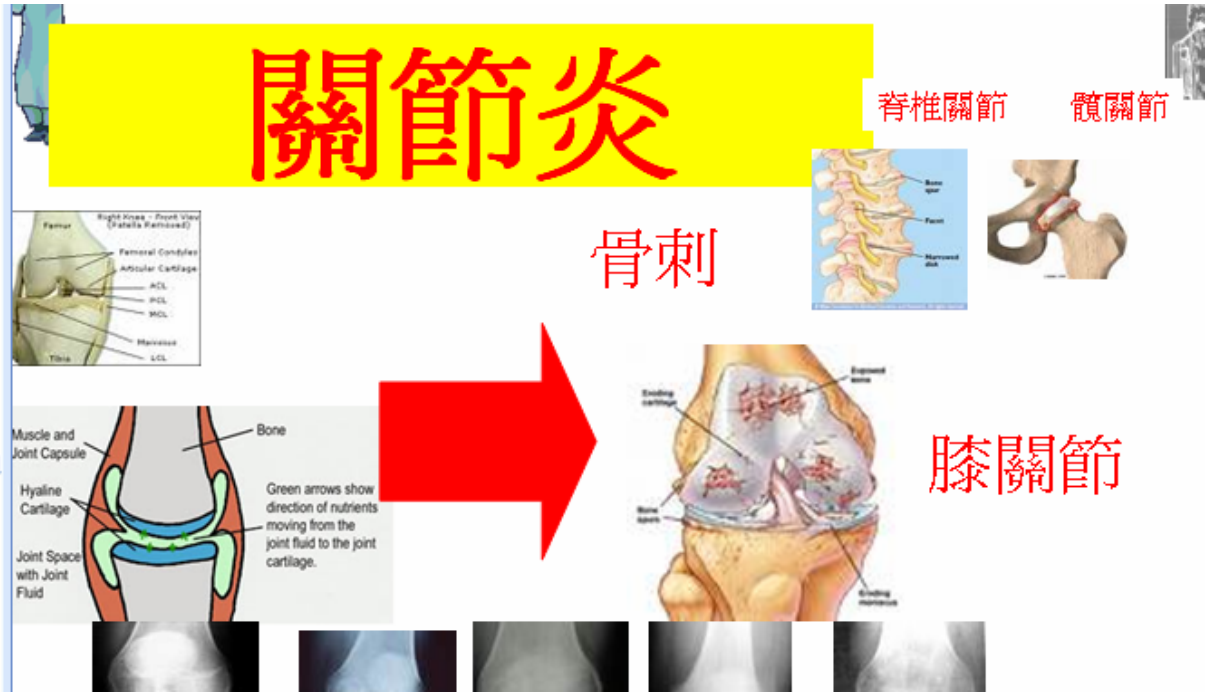
Graft choice:無理想之植入物

BPTB autograft is still the most commonly used graft source for primary ACL reconstruction, but hamstring autograft and allograft tissue grafts are becoming increasingly popular.
Good-to-excellent results can be expected with any of these graft selections provided the surgeon's expertise with the selected technique, proper selection of fixation devices, and formal rehabilitation.

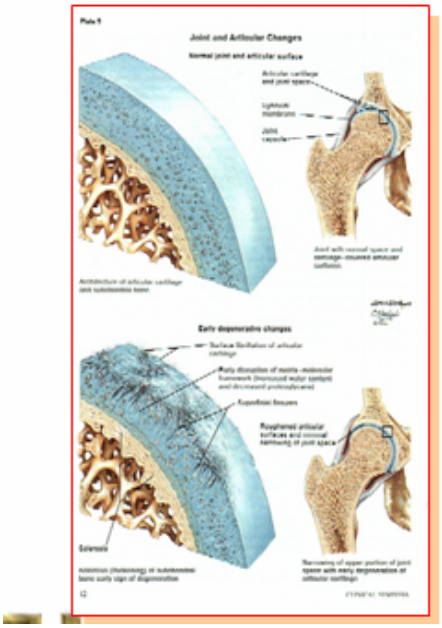
Tissue engineering

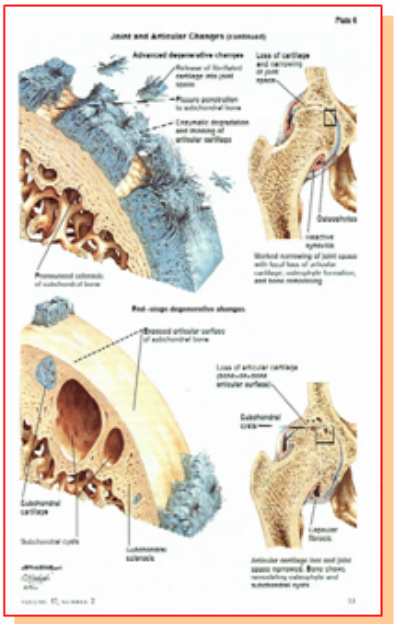
組織工程

關節炎怎麼辦



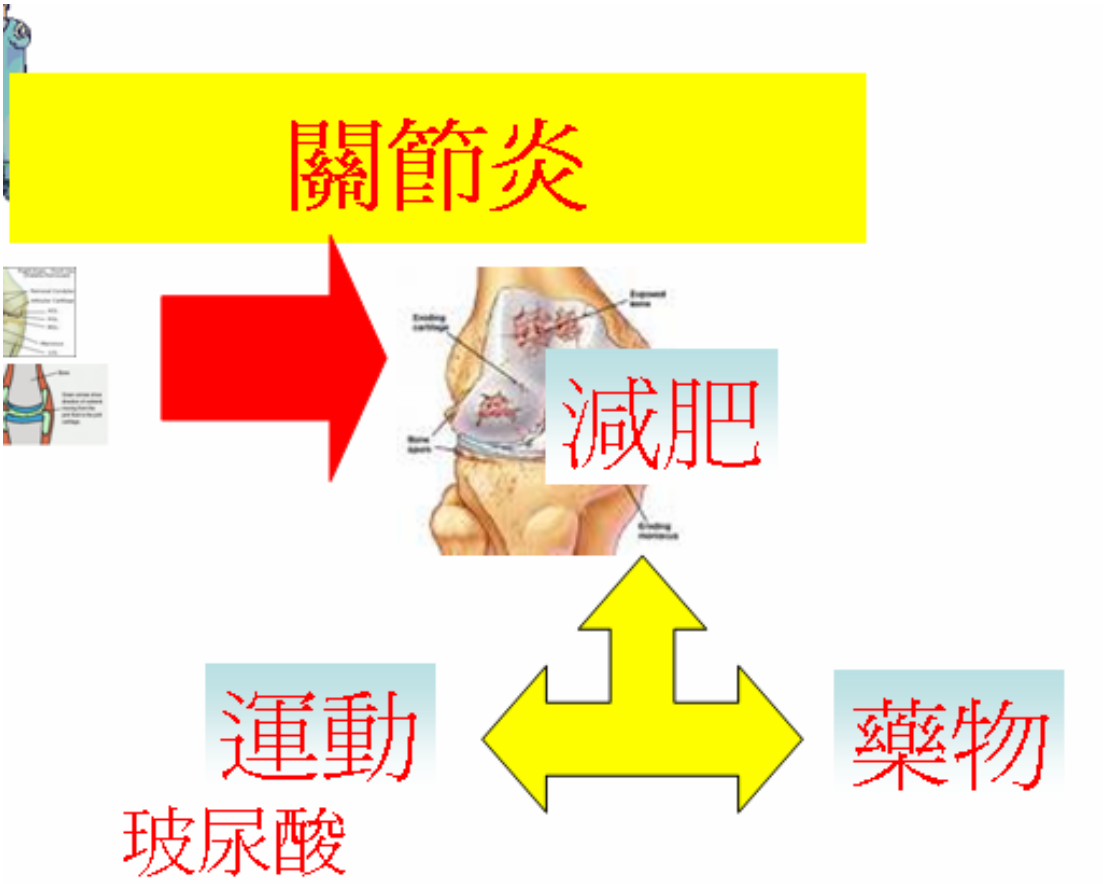
Joint and Articular Changes

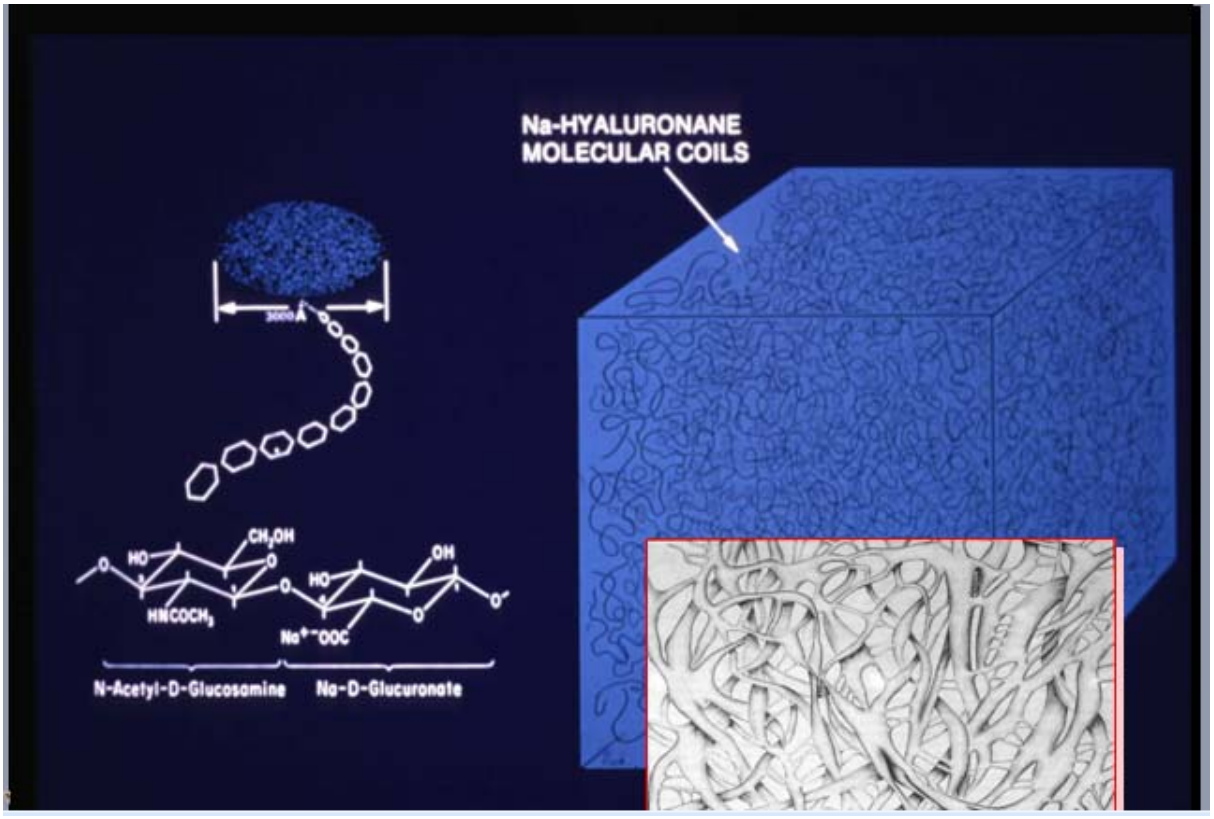

Joint and Articular Changes
Normal joint and articular surface
Early degenerative changes


Joint and Articular Changes (continued)
Advanced degenerative changes
Post-stage degenerative changes


關節炎
減肥
運動
藥物


關節炎
手術
種軟骨
鑽洞
組織工程軟骨


關節炎
減肥
運動
玻尿酸
藥物

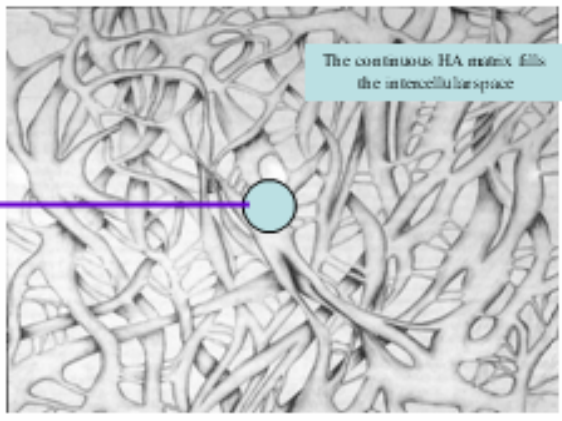


Hyaluronan in the Synovial Tissue

Although HA matrix is freely permeable to smaller molecules (water & nutrients), the hyaluronan molecular matrix affects the free movement and chemical activity of large molecules like antibodies and fibrinogen (the excluded volume effect)

Hyaluronan controls transynovial flow

A schematic representation of normal synovial membrane. Type A and type B cells (synoviocytes) lie suspended in a network of hyaluronic acid molecules (HA). From Weiss C. The basic structure of diarthrodial joints. In Resnick J (ed.). Arthroscopic Surgery. New-York, McGraw-Hill, 1988.



Artist's impression of a HA meshwork at physiological concentration of HA, taken from electron micrographs of rotary shadowed HA.

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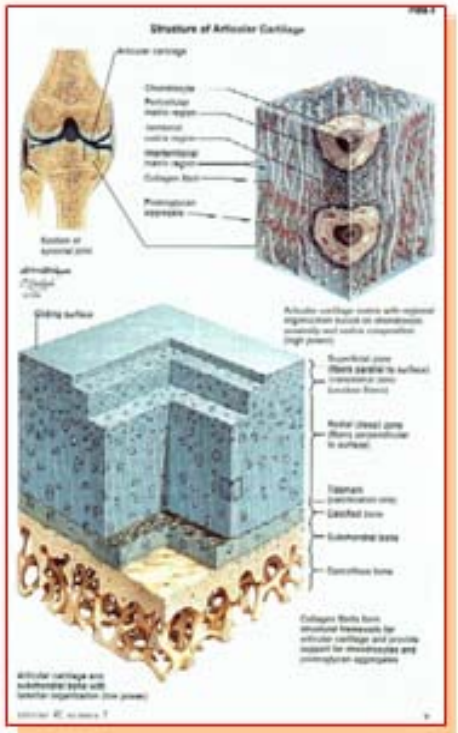
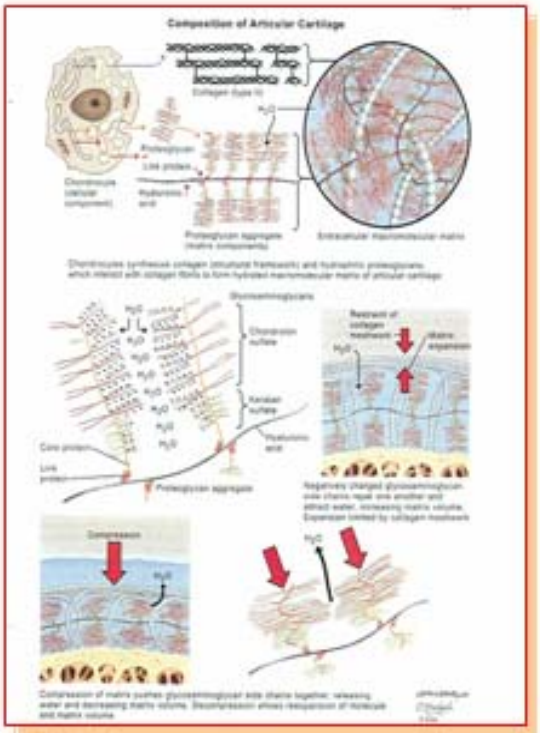
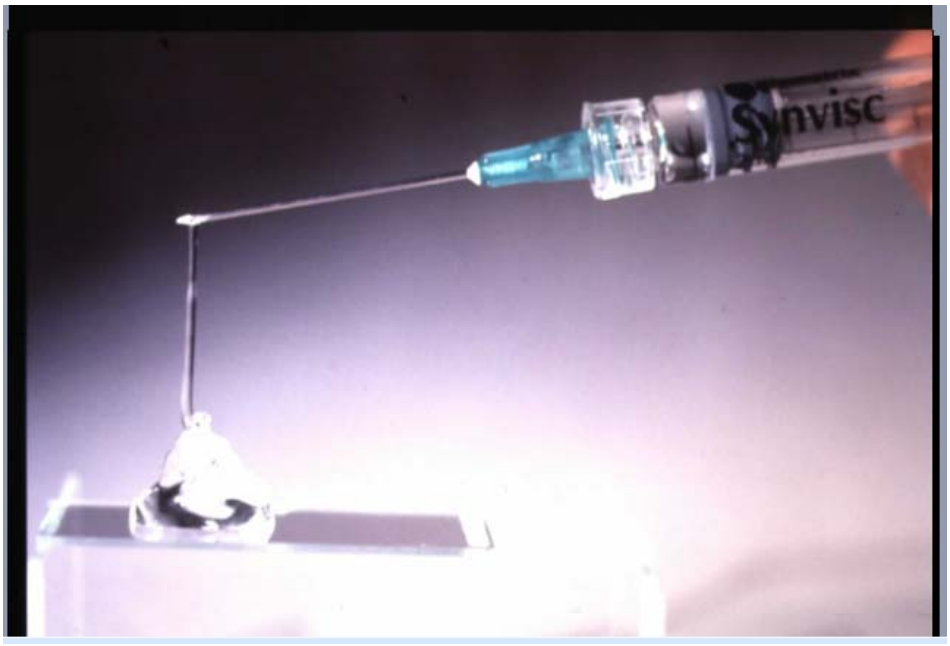
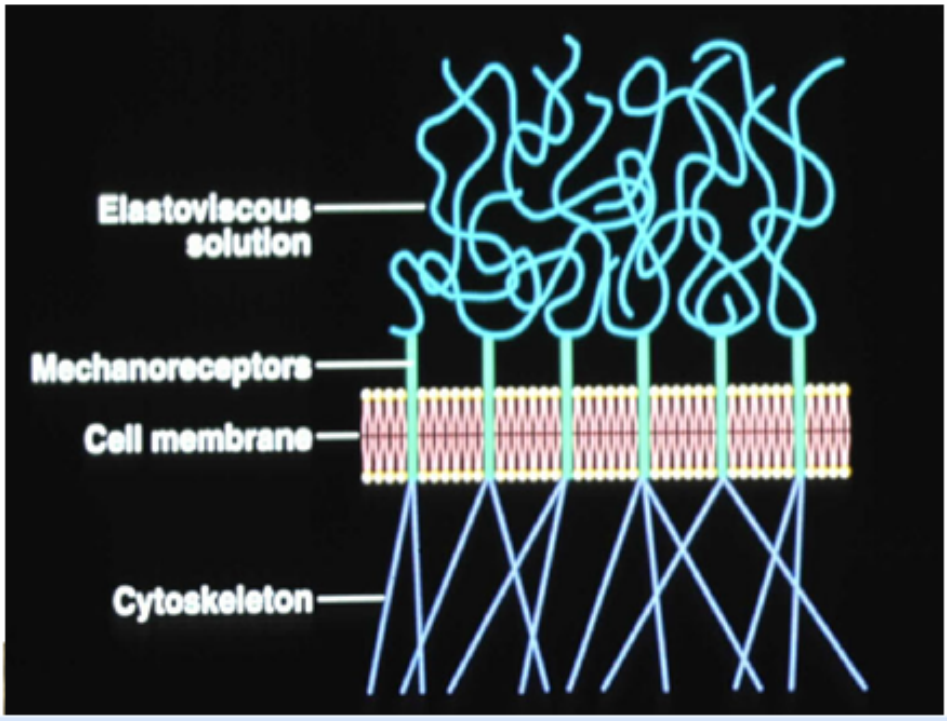
HA in Cartilage







Pericellular Environment in Presence of Elastoviscous Hyaluronan



玻尿酸可促進軟骨生長

Pericellular Environment in Presence of Non-Elastoviscous Hyaluronan