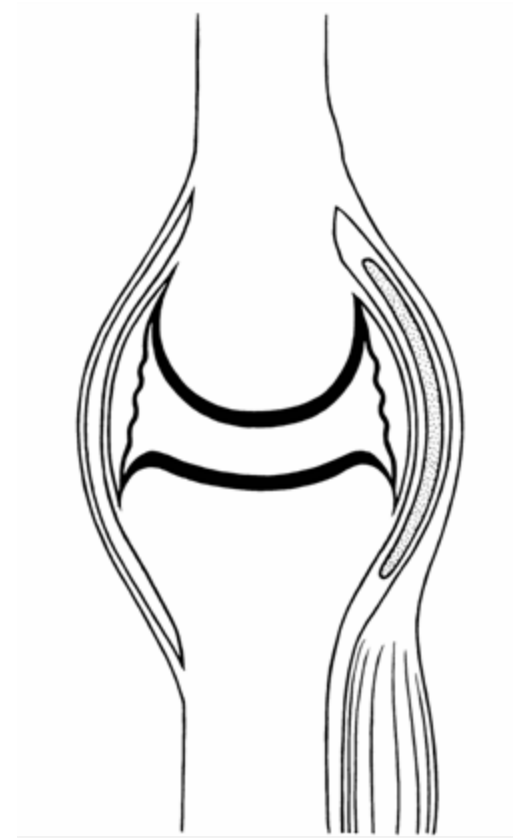


Synovial Membrane
(aka synovium)

and

Synovial Fluid



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Unlabelled Images used in these notes are taken from-
The Sourcebook of Medical Illustration, P Cull ed. The Parthanon Publishing Group Limited 1989
Mediclip Human Anatomy 1, 2 & 3 Williams & Wilkins A Waverley Group 1996
Fundamentals of Anatomy and Physiology F. Martini 7th ed, Pearsons, 2006

Where do we find Synovial Membranes? 🗨️

1. Part of Synovial Joints 🗨️

Lining the joint capsule

Attaches to articular margin

2. Bursa, bursae 🗨️

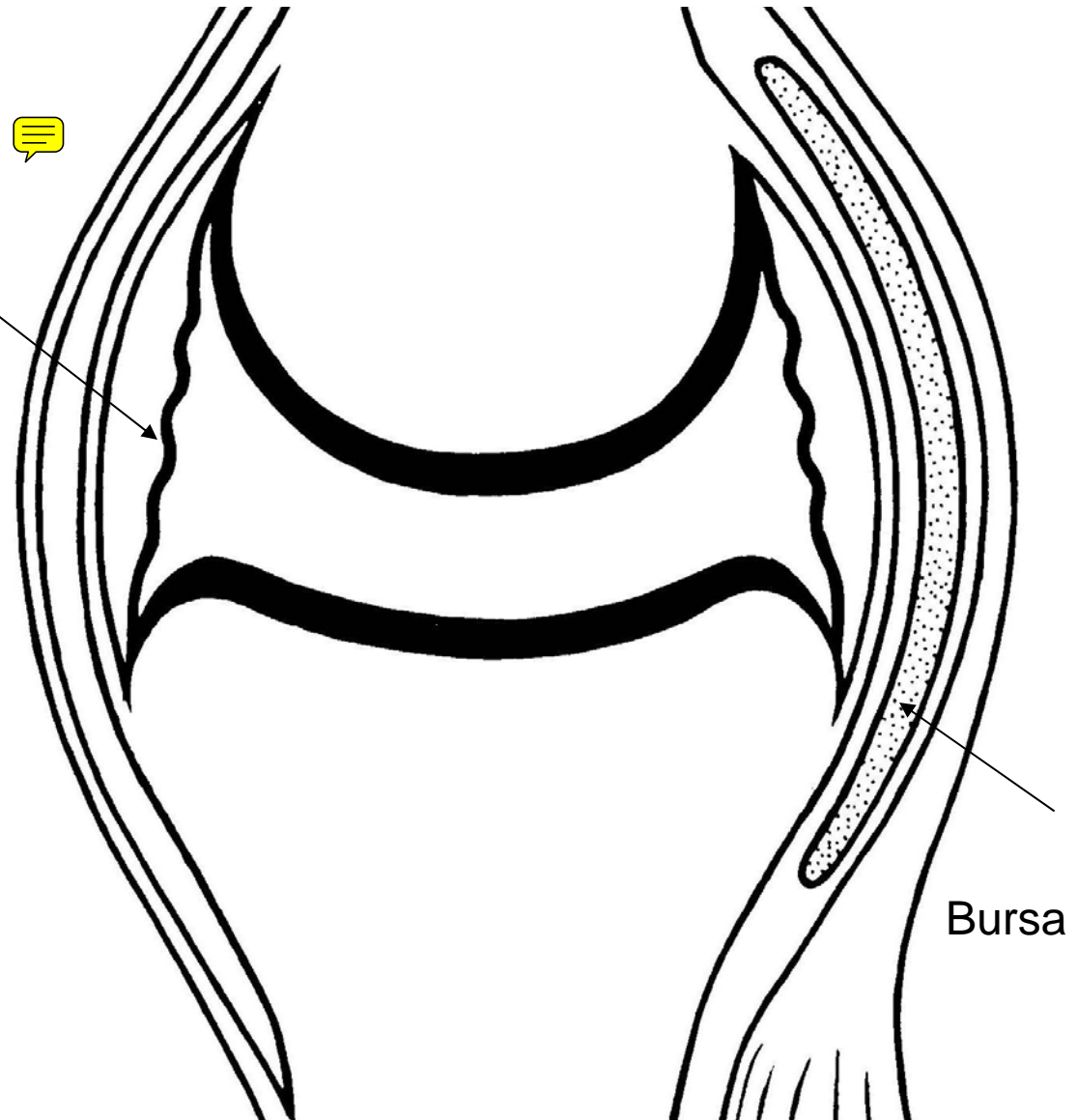
Sac like dilation

Lined with synovial membrane

Filled with synovial fluid

3. Tendon Sheaths 🗨️

Bursae that have tendons embedded in them



2. Bursa

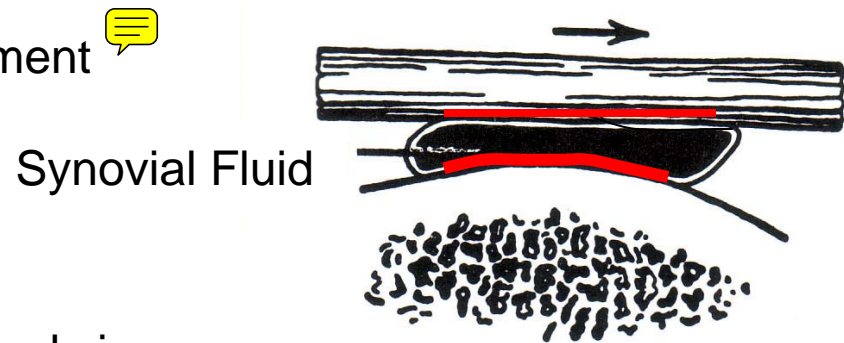
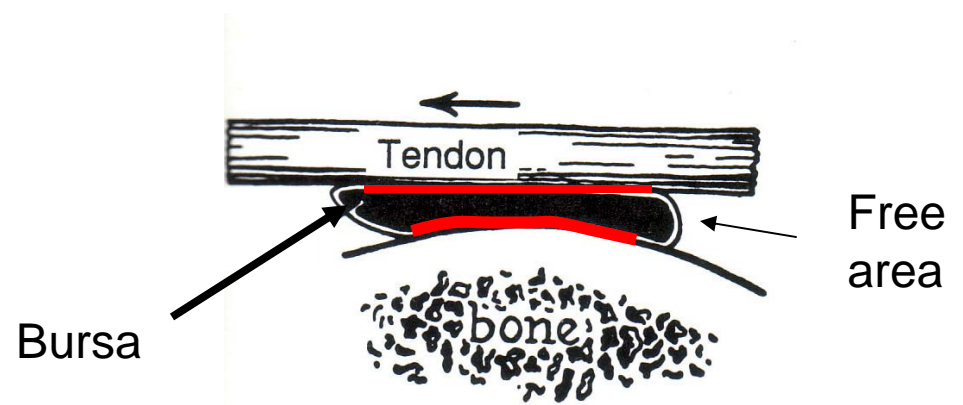
Synovial Fluid filled sac

- develops between
- * tendon and a bone
- * tendon and joint capsule
- * tendon and tendon
- * tendon and skin



limited attachment to the tendon

limited attachment to “the other”

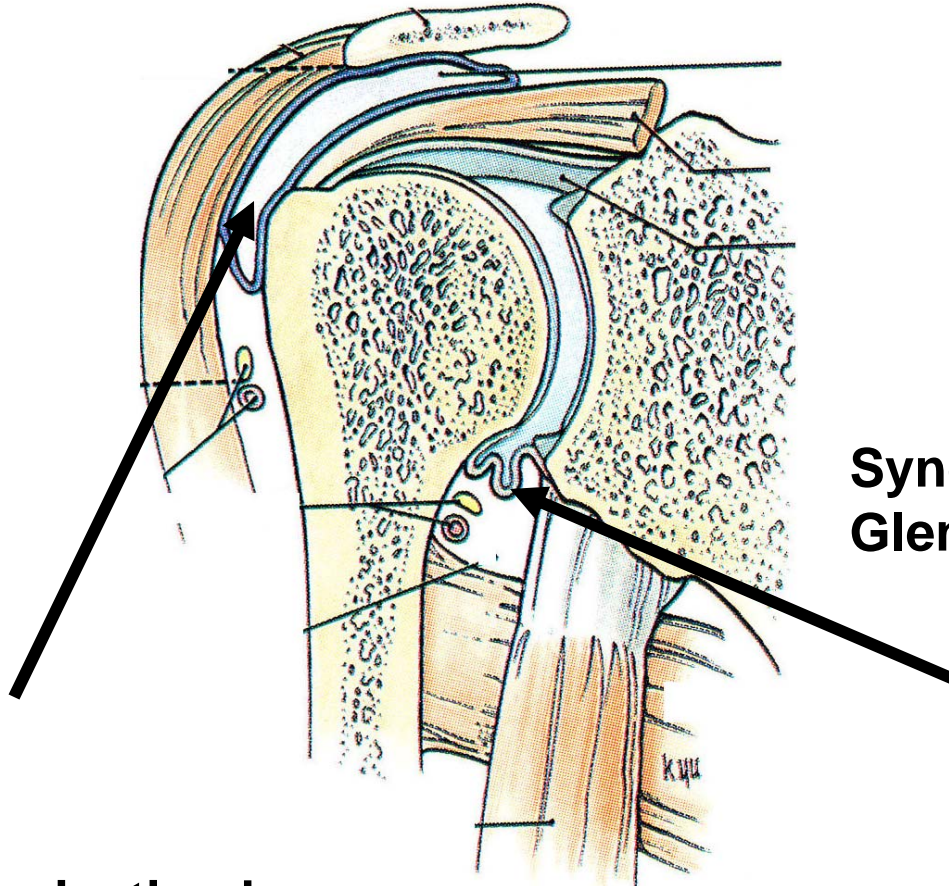
Free areas at ends facilitate movement 



Bursae come in a number of shapes and sizes

Communicating  or non communicating 

Examples



**Synovial membrane of
Glenohumoral joint**

**Non communicating bursa
Subacromial Bursa** 

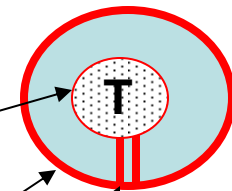
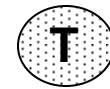
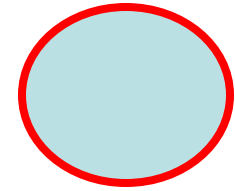
Posterior View

3. Synovial Sheaths

Synovial sac with tendon embedded 

May be a single tendon
Eg flexor digital sheaths

May be a number of tendons
embedded into the same sheath
Eg common flexor synovial sheath

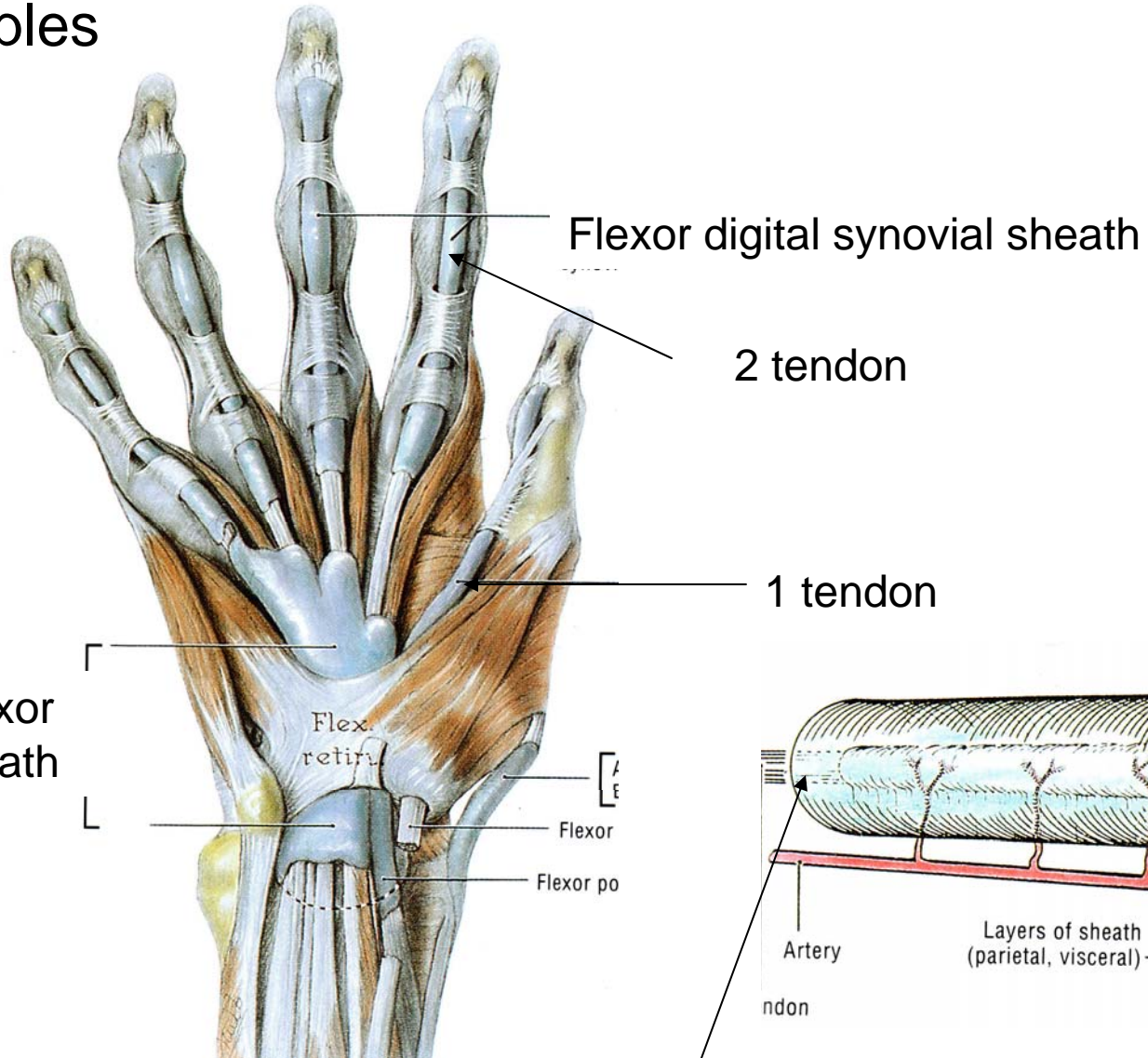


Visceral layer – next to tendon

Parietal layer- secured to surrounding structures 

Mesotendon transmits blood vessels 

Examples



Free edge

Characteristics of **Normal Synovial Fluid**


i) Physical characteristics

Clear, Colorless to light yellow

Thick fluid - Consistency of egg white

Small volume in any joint eg knee 3.5mL

ii) Mechanical properties

High Viscosity – slipperiness 

High Elasticity – deforms under pressure 

iii) Major components


Hyaluronan (atypical PG)  Viscous and elastic properties

Lubricin (PG)  **lubricant** attaches to articular surfaces

Water Carries substances in solution

Small plasma proteins 

Glucose and other nutrients

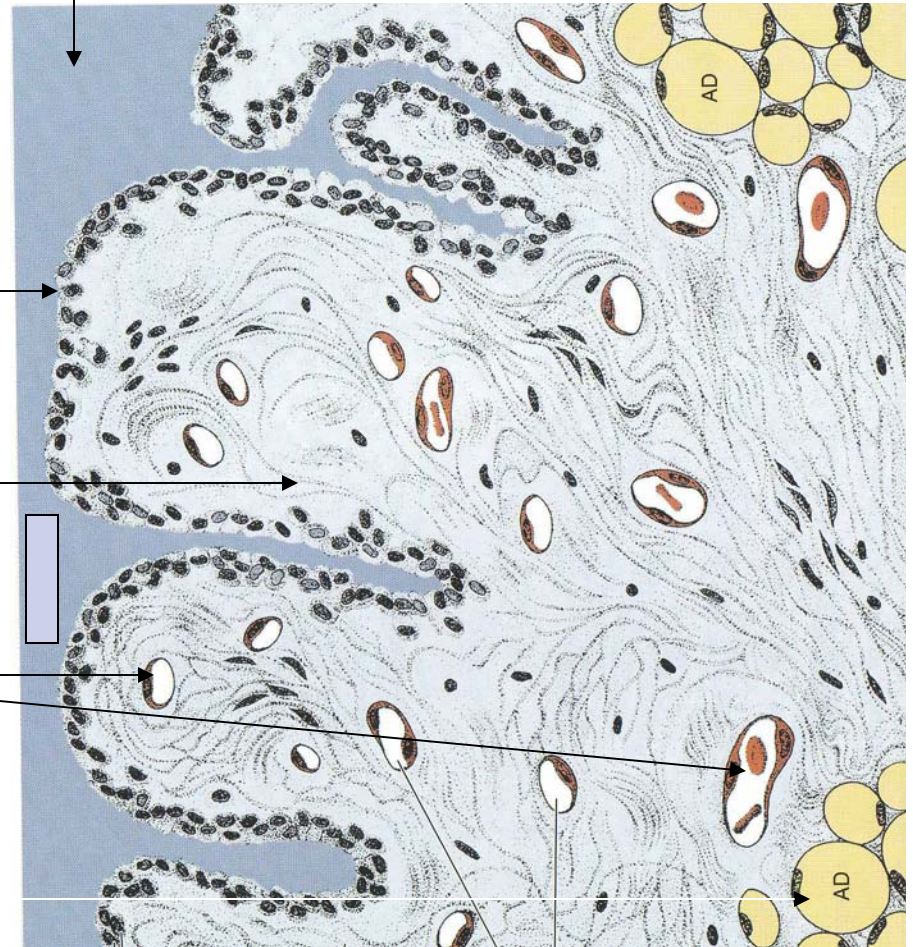
Diffuse from capillaries
Ultrafiltrate of plasma 

Structure of a synovial membrane

Highly Folded thin membrane

Synovial fluid

Capsule



i) Intima

Lining cell layer
1-2 cells thick


ii) Loose Connective tissue layer

- Fibroblasts + other cells
- Many Blood vessels
Arterioles and venules
- Collagen and reticular fibers
- Highly liquid ground substance

Specific Structural features of synovial membrane

Type A

Macrophage like cells

Remove debris from the joint by phagocytosis 

Monitor homeostatic mechanisms 

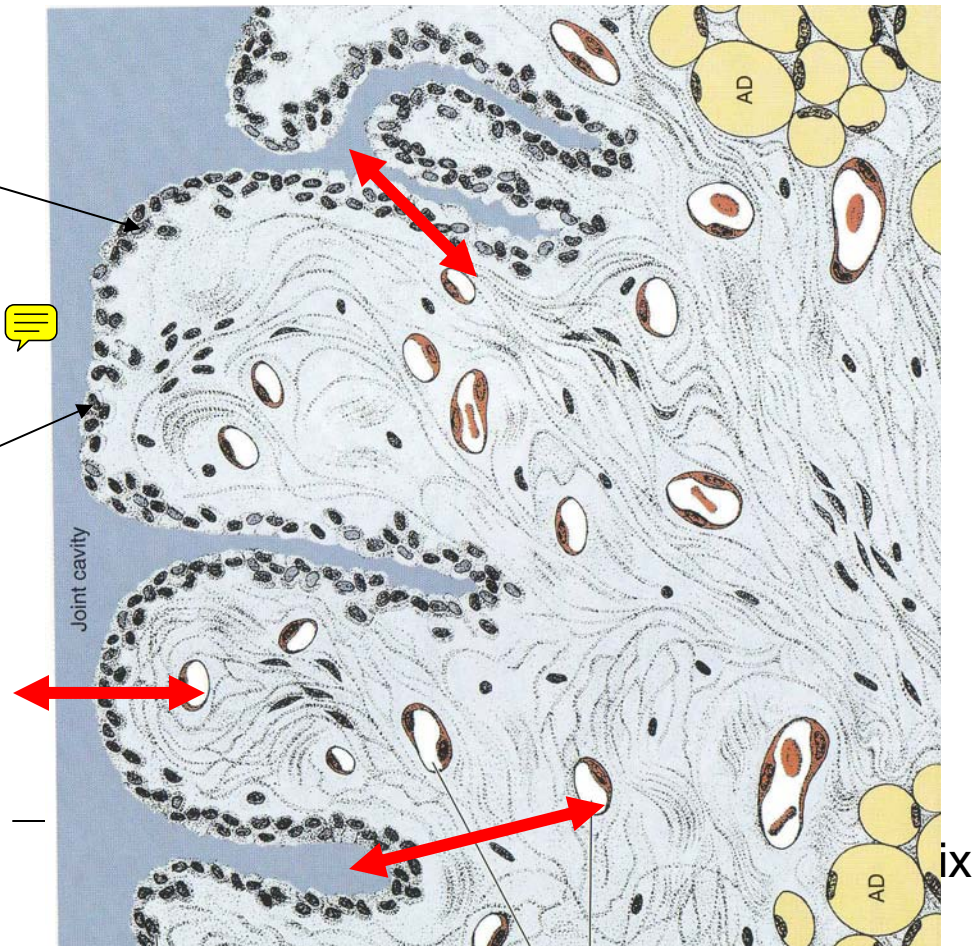
Type B

Fibroblast like cell

produce hyaluronan
Important part of synovial fluid

Fenestrated capillaries

Blood nutrients and water diffuse through the intercellular space, between cells into the joint cavity



Functions of a **synovial membrane**

Mechanical

makes synovial fluid

which is the lubricant between moving surfaces within the joint

Metabolic

delivers nutrients and metabolic waste products between blood and hyaline cartilage 


Functional

provide a smooth and non adherent surface to facilitates movement

Maintains synovial fluid - removal of debris 

Normally Synovial Fluid has ..

Little volume and NO Cells ...
SO there are

NO leukocytes (white blood cells)

NO Mast cells

NO red blood cells

NO chondrocytes

NO Type A or Type B synovial cells

NO plasma clotting factors

NO culture (no bacteria)

If these factors are present it indicates

Effusion or edema

Inflammation

Inflammation

haemarthrosis

Osteoarthritis Trauma

Disintegration of membrane

Vascular dysfunction

Septic

Cellular Abnormalities of Synovial Membrane in inflammatory joint disease

Fibroblasts proliferate and produce more collagen – thickens membrane

Resident Mast cells degranulate – inflammatory mediators eg histamine

Intima Cells - Type A Macrophage like cells and Type B fibroblast like cells become very stressed and die



Leukocytes migrate into membrane and participate in inflammatory response

- Neutrophils
- Monocytes
- lymphocytes

Membrane becomes thickened and densely cellular
All characteristic of acute inflammatory response

Tissue Abnormalities of Synovial Membrane in inflammatory joint disease

- *Membrane becomes thickened*

IMPLICATION Prevents normal movement of Water, small proteins, nutrients to the synovial fluid and removal of metabolic wastes from the synovial fluid. 


- *excessively vascular* 

IMPLICATION Large proteins move from the vascular compartments into the s. membrane and clog it up.

- *densely cellular*

IMPLICATION Leukocytes and mast cells move in to the membrane and set up inflammatory processes to remove unwanted proteins or dead and dying cells

All characteristic of acute inflammatory response 

Abnormalities of **Synovial Fluid** in inflammatory joint disease

1. Volume

Increase amounts of synovial fluid within the joint → swelling

2. Composition

Decrease hyaluronan content → reduced viscosity and elasticity

Increased protein content  – clotting of synovial fluid

Reduced nutrients → damage / death to chondrocytes due to decrease nutrition and metabolic waste transfer

3. Cellular Composition

Increased inflammatory cells – inflammatory response continues

Cartilage fragments – damage to articular surface → abrasions

Dead and dying cells – dislodged from membrane Type A and Type B cells

Joint damage in inflammatory joint disease due to **abnormalities in synovial fluid**

Increase amounts of synovial fluid

- > joint swelling -> stretching of ligaments ->
Rupture of ligaments -> joint instability and deformation

Decrease hyaluronan content of synovial fluid – reduced viscosity & elasticity

Increased protein content – clotting of synovial fluid

- > decreased protection of articular surfaces -> abrasions
- > cartilage erosion

Decrease nutrition and metabolic waste transfer

Chondrocytes starved of nutrients and die

Fragments of cartilage float in fluid -> abrasions of articular surfaces