

## The Myxochondroid Sac - Ganglion Cyst

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### Introduction

#### Preface

Ganglion cysts are designated as benign, soft tissue tumours which typically enunciate a herniation of the joint capsule. Ganglion cysts are frequently encountered in the wrist joint, although no joint is exempt. Dorsal aspect of the wrist joint is a common site for discerning a ganglion cyst followed by the palmar aspect<sup>[1]</sup>. Ganglion cysts are cogitated as synovial cysts with a constituent fluid which is chemically identical to synovial fluid in addition to impacted mucoid, gelatinous material. Ganglion cysts can appear as multi-ocular cysts. Ganglion cysts are a frequently delineated soft tissue masses discovered on the hand, wrist, knee and foot. Although majority of ganglion cysts are asymptomatic, pain, tenderness weakness and cosmetic derangements can ensue of obscure aetiology, ganglion cysts arise from repetitive micro trauma with consequent mucinous degeneration of encompassing connective tissue<sup>[2,3]</sup>.

#### Disease Pathogenesis

Ganglion cyst is a frequently denominated, tumour-like condition of the soft tissue. The condition is engendered by a mucoid degeneration of the joint capsule, tendon or tendon sheath. Ganglion cysts can arise due to joint injury or wear and tear of the specified joints. Several theories have been eulogized in the occurrence of ganglion cyst. However, a consensus in genesis of the lesion is lacking. A particular theory forwarded by Eller in 1746 indicated that ganglion cysts are configured on account of herniation of synovial tissue within the joint space. A theory from Carp and Stout elucidated in 1926 articulated the contemporary premise that ganglion cysts arise due to mucinous degeneration of enveloping connective tissue contingent to its chronic deterioration<sup>[2,3]</sup>.

Currently, it is contemplated that ganglion cysts emerge from mesenchymal cells within the synovial capsular junction consequent to repetitive micro-injury. Persistent injury to supporting capsular and ligamentous configurations stimulate the encompassing fibroblasts to generate hyaluronic acid with subsequent accumulation and articulation of a mucinous, "jelly like" material which is a common constituent of the ganglion cyst. Of unknown aetiology, analysis of cyst fluid depicts that the fluid

is biochemically diverse and increasingly viscous, in contrast to the intra-articular synovial fluid. Origin of cyst fluid is not fully elucidated but is postulated to arise from 3 mechanisms. Firstly, it can arise from within the joint space and is pumped into the cyst due to wrist mobility. Secondly, accumulation of cyst fluid can be a consequence of an extra articular degenerative process with sequential cyst formation and subsequent communication with the joint space. Finally, it may arise from the mesenchymal cells adherent to the cyst wall. A combination of aforesaid pathogenic mechanisms can contribute to the configuration of ganglion cyst fluid<sup>[2,3]</sup>.

#### Disease Characteristics

Ganglion cysts are miniature, cystic nodules devoid of an epithelial lining and usually arise adjacent to a joint capsule or tendon sheath. The wrist, hand and feet are frequent sites of emergence of ganglion cysts, whereas the intra-tendinous regions rarely depict the aforesaid cysts. Ganglion cysts elucidate an estimated 60% to 70% of soft tissue nodules situated on the hand and wrist. Ganglion cysts frequently appear betwixt 20 years to 50 years of age, although no age is exempt. A female predominance is enunciated with a female to male ratio of 3:1. Ganglion cysts commonly arise in gymnasts on account of stress and repetitive trauma to the wrist.

Ganglion cysts do not communicate with abutting joint spaces. Exceptionally, ganglion cysts can be intra-osseous, as designated in medial malleolus of tibia<sup>[4,5]</sup>.

Majority (70%) of ganglion cysts are frequently cogitated on the dorsal aspect of the wrist joint. Aforesaid ganglion cysts arise from the scapholunate ligament or scapholunate articulation. An estimated 20% of ganglion cysts are situated on the

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volar aspect of wrist joint and emerge from the radio-carpal joint or scapho - trapezial joint. Around 10% of ganglion cysts are engendered from multiple body sites such as volar retinaculum of the wrist, distal inter-phalangeal joint, ankle joint and foot. Ganglion cysts of the volar reticulum of wrist joint are generated from protrusion of herniated tendon sheath fluid.

Ganglion cysts encountered within the dorsal distal inter-phalangeal joint are cogitated as mucous cysts and are accompanied with Herbeden's nodules. Aforesaid ganglion cysts are commonly enunciated in the female population, particularly betwixt 40 years to 70 years of age and can be associated with osteoarthritis<sup>[4,5]</sup>.

### Clinical Elucidation

Majority of ganglion cysts are asymptomatic. However, the cysts can demonstrate cosmetic derangements thereby necessitating therapeutic intervention. Individuals can experience pain, tenderness and weakness which are exacerbated with movements of the wrist joint. Ganglion cysts commonly exhibit localized pain, prostration, bony weakness and partial disability of the joints. Individuals can describe the appearance of a painless lump or pain within the posterior inter-osseous nerve on applying pressure.

Ganglion cysts exhibit a firm, well circumscribed, mobile, soft tissue nodule ranging from one centimetre to three centimetres in magnitude. Ganglion cysts are frequently adherent to the underlying, deep-seated soft tissue and remain unattached to the superimposed cutaneous covering<sup>[5,6]</sup>.

Subjects with ganglion cysts situated on volar surface of wrist joint can infrequently enunciate carpal tunnel syndrome or a trigger finger. Aforesaid manifestations appear contingent to the compression of median nerve or impingement of the cyst on upon the flexor tendon sheath. Volar ganglion cysts confined to the wrist joint can initiate ulnar nerve neuropraxia and compression of radial artery with consequent ischemia. Dorsal ganglion cyst emerges as a diverticular mass engendered from segment of the joint capsule adherent to scapholunate ligament<sup>[6,7]</sup>.

### Histological Elucidation

Ganglion cysts are synovial cysts impacted with mucin and demonstrate a pauci-cellular component of connective tissue. Ganglion cysts contain fluid engendered from a tendon sheath or a joint.

As ganglion cysts are inherently benign, a cogent tissue sampling remains an unnecessary procedure for evaluation. A characteristic morphological exemplification exemplifies a pouch impacted with mucin, an admixture of synovial cells and an absence of a true coating of specific epithelial cells. Ganglion cysts can be constituted of a singular or multiple locules. Ganglion cysts are essentially layered with dense, fibrous tissue with an absence of a coating of synovial or epithelial cells. Rupture of ganglion cyst can be accompanied by an enveloping inflammatory exudates<sup>[7,8]</sup>. Cystic spaces cogitated within the ganglion cyst demonstrate a layering of histiocytes and granulation tissue. Moderate quantities of acute and chronic inflammatory cells can be enunciated within the cyst wall. Abundant and viscous, mucinous material constituting a majority of ganglion cysts is enunciated and is intensely thickened on account of elevated concentration of hyaluronic acid and muco-polysaccharides. Ul-

tra-structural examination of the wall of ganglion cysts depicts sheets of collagen configured in multi directional layers, comprising of intermittently dispersed, flattened mesenchymal cells recapitulating fibroblasts<sup>[2,3]</sup>.

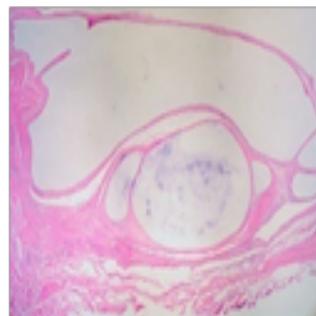


Figure 1: Ganglion cyst with compressed synovial cells, scanty connective tissue and absence of epithelium<sup>[11]</sup>.

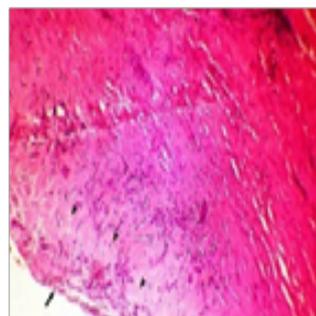


Figure 2: Ganglion cyst with attenuated synovial cells and a content of myxochondroid substance<sup>[12]</sup>.



Figure 3: Ganglion cyst with attenuated synovial cells, gelatinous content and a superimposed, stratified squamous epithelium<sup>[13]</sup>.

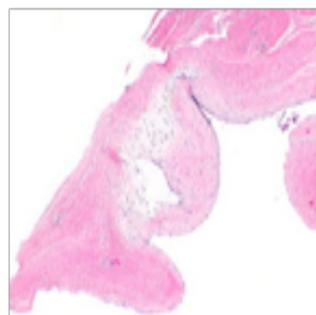
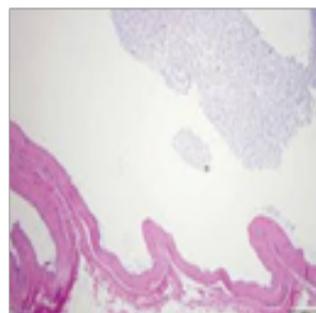


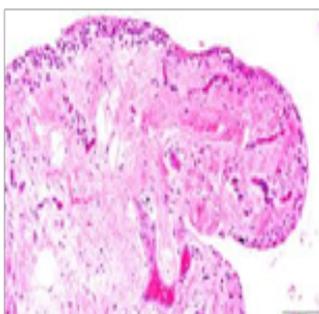
Figure 4: Ganglion cyst with a thinned out synovial cell coating, absent epithelial cells and a myxoid content<sup>[14]</sup>.



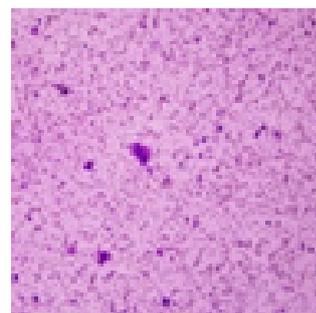
**Figure 5:** Ganglion cyst with flattened synovium, absent epithelium and impacted hyaluronic acid material<sup>[15]</sup>.



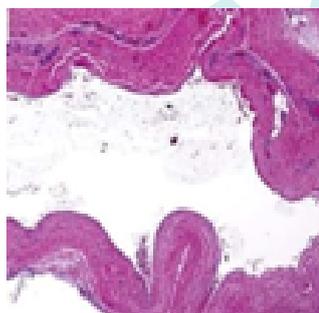
**Figure 9:** Ganglion cyst with an undulating, pauci-cellular connective tissue and an impaction with gelatinous content<sup>[18]</sup>.



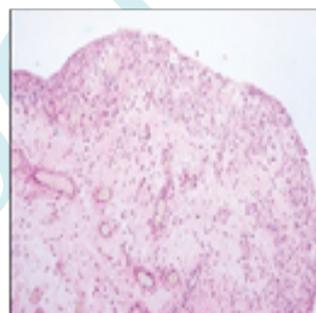
**Figure 6:** Multiloculated ganglion cyst with stretched out synovial cell layer, lack of epithelial layer and gelatinous content<sup>[16]</sup>.



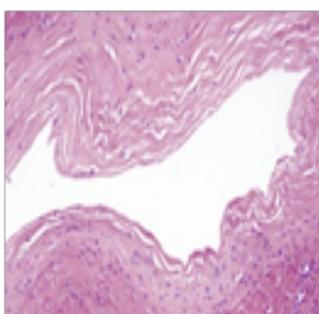
**Figure 10:** Ganglion cyst with disseminated myxochondroid substance and synovial cells with scanty connective tissue<sup>[19]</sup>.



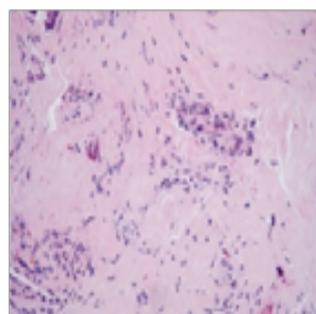
**Figure 7:** Ganglion cyst with pauci-cellular connective tissue envelop and an expansive synovial lining<sup>[17]</sup>.



**Figure 11:** Ganglion cyst with mildly cellular fibro-connective tissue and synovial coating devoid of epithelium<sup>[20]</sup>.



**Figure 8:** Ganglion cyst with extensive synovial tissue coating, and a circumscribing, scantily cellular connective tissue<sup>[17]</sup>.



**Figure 12:** Ganglion cyst with minimally cellular connective tissue and a myxoid impaction<sup>[21]</sup>.

### Investigative Assays

Appropriate diagnosis can be achieved with a comprehensive history and suitable clinical examination which records the magnitude, location and consistency of the nodule. Plain radiographs are obtained in order to exclude associated intra osseous manifestations. However, plain x-rays will generally be unremarkable. Magnetic resonance imaging can be adopted in instances

of ganglion cysts with accompanying solid tumour. T2 weighted magnetic resonance imaging demonstrates a well defined, solid mass of uniform fluid intensity<sup>[8]</sup>. Ultrasound is a diagnostic modality which can be employed to differentiate a ganglion cyst from a vascular malformation. Additionally, it can be applied to prevent an unintentional perforation of the radial nerve while attempting a fine needle aspiration of the cyst. Ganglion cysts generally depict a cogent trans-illumination on physical examination<sup>[8,9]</sup>.

### Therapeutic Options

Majority of the ganglion cysts are asymptomatic, however a surgical eradication can be adopted with the appearance of pain or for superior cosmetic outcomes. Ganglion cyst resolves spontaneously in an estimated 40% to 50% instances. Several treatment options are available for managing a ganglion cyst such as simple observation, singular aspiration of the cyst contents, surgical elimination, seton or the administration of steroids. Therapy can be required simply for cosmetic enhancement.

Ganglion cysts can be appropriately managed by non surgical and surgical methodologies. However, non-operative measures are accompanied by increased incidence of cyst recurrence. Asymptomatic subjects depicting ganglion cysts can be offered simple observation and verbal reassurance is adequate as the cyst is benign and can undergo spontaneous retrogression<sup>[9,10]</sup>. Non invasive therapy can be adopted subject to cyst localization. Dorsal ganglion cysts of the wrist can be managed with simple aspiration, a procedure which is accompanied by an enhanced proportion of cyst recurrence, in contrast to a cogent surgical excision. Simple aspiration of the volar ganglion cyst of the wrist is abstained from on account of the proximity to radial nerve. Surgical extermination of the cyst is indicated in instances of persistent clinical symptoms and instances of inadequate therapeutic outcomes on conservative management. Surgical extermination of the cyst aids in relieving the clinical symptoms. Nevertheless, caution should be exercised in order to prevent injury to abutting neurovascular bundles.

Surgical extermination of the ganglion cyst is a simple procedure and can be performed in the out-patient's department. Dorsal ganglion cyst on the wrist joint can be accessed with a transverse incision applied directly above the cyst with the intention of exposing the pedicle of ganglion cyst. Abstinence from rupture of the ganglion cyst is mandated, thereby incurring a difficulty in excising the capsular attachments<sup>[9,10]</sup>. Incompetent resection of the pedicle or segments of cyst capsule and capsular attachments can enhance the proportionate recurrence of the cyst. Volar ganglion cysts of the wrist can exemplify an abutment of radial artery or can encompass neighbouring blood vessels. Thus, a blunt dissection is advocated in order to prevent damage to the vasculature. Possible resection of the palmar cutaneous branch of median nerve can occur as it commonly appears 5 centimetres proximal to the wrist joint. Palmar ganglion cyst of the wrist can be suitably managed by therapeutic measures such as aspiration of the cyst content or with a surgical eradication of the cyst. A frequent complication of surgical extermination of the ganglion cyst is a reoccurring ganglion cyst. Volar ganglion cyst of the wrist frequently demonstrates reappearance, in contrast to a dorsal ganglion cyst. Ganglion cysts usually demonstrate a proportionate recurrence of 15% to 20%. Setoning is a

procedure which is accompanied by minimal cyst recurrence and reduced complications. Women of younger age preferential adopt the treatment methodology of aspiration of cyst contents or setoning, in contrast to a surgical extermination, in order to reduce postoperative scarring and for superior cosmetic or therapeutic outcomes. Therapeutic complications are incriminated by infection of site of surgery, commonly enunciated in around 35% individuals opting for setoning, approximately 11.53% subjects undergoing a surgical excision and nearly 8.33% instances of cyst aspiration<sup>[3]</sup>. Proportionate complications are enhanced on account of presence of foreign body such as silk, employed in setoning, which incurs inflammation and infection subsequent to intervention. However, the proportion of therapeutic complications can minimally be exemplified at 5%. Cyst recurrence can be diversely enunciated with various therapeutic procedures and is exemplified in approximately 52.77% instances with cyst aspiration, roughly 15% subjects with setoning procedures and nearly 13.64% individuals with surgical intervention. Reappearance of ganglion cyst following aspiration of cyst content ranges from 47% to 67%.

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