

# Neoplasms and Tumor-Like Lesions of the Hand

Badr AbdullGaffar\*

*Pathology Section, Rashid Hospital, Oud Metha Road., Dubai, United Arab Emirates*

**Abstract:** The hand is a very versatile functional part of the body and therefore more prone to trauma and thus trauma-related tumor-like lesions are more likely to develop in the hand and wrist region. A broad spectrum of variable lesions can involve the hand. Most are benign non-neoplastic trauma-induced tumor-like lesions. True neoplasms of the hand are predominantly benign. Primary malignant tumors of the hand are rare, apart from the common cutaneous malignancies, for example basal cell carcinoma, squamous cell carcinoma and melanoma. Secondary metastases are very rare. Most of the hand lesions are histologically recognizable without problems. Certain highly proliferative and cellular lesions, particularly soft-tissue and skeletal benign pseudosarcomatous tumors and tumor-like lesions, can lead to misdiagnosis. The unwary pathologists, on occasions, could misinterpret them as sarcomas with catastrophic surgical management consequences for the patients. Awareness of the spectrum of neoplasms and pseudotumors that involve the hand will help pathologists avoid these interpretation errors and guide surgeons to the best surgical management for the patients.

We conducted a retrospective review study to investigate the prevalence and spectrum of hand neoplasms and tumor-like lesions in a setting of a general community-based hospital practice compared with studies conducted in specialized tertiary reference-based hospitals in developed countries.

**Keywords:** Hand, wrist, fingers, neoplasms, tumor-like lesions.

## INTRODUCTION

Tumors and tumor-like lesions of the hand are common and they cover a vast array of different lesions [1-7]. Most are commonly encountered lesions, but rare and unusual tumors and tumor-like lesions do occur [1-8]. The rarer lesions may impose a diagnostic challenge for the pathologists and may lead to erroneous interpretation of these benign lesions as sarcomas with catastrophic consequences for the patients [8, 9]. Some lesions are particularly unique but not entirely exclusive to the hand region [1, 4]. Others are almost exclusive to the hand region particularly the fingers, for example mucous cyst, infantile fibromatosis and thus they are nominated as digital [4]. Orthopedic hand surgeons, general surgeons and radiologists conducted the majority of studies that focused on hand lesions [1-6, 10-12]. Dermatologists and pathologists, on the other hand, showed less interest to conduct studies focusing on the prevalence and spectrum of hand lesions and their interpretation challenges.

We carried a retrospective review study to investigate the prevalence and the wide spectrum of hand neoplasms and tumor-like lesions in a general community-based hospital. Our study highlights the importance of becoming familiar with the different hand lesions, particularly the pseudosarcomatous lesions from the perspectives of surgeons, dermatologists and pathologists.

## MATERIALS AND METHODS

We carried a retrospective review study over five years from December 2011 to January 2006. A computer-based search in the pathology department was used to retrieve all lesions that involved the hand, wrist, fingers, nails and palms. Infectious lesions, for example, viral warts and congenital anomalies, for example extra digits were excluded from the study. Melanocytic nevi and inflammatory skin and soft-tissue lesions, for example, gouty tophi and rheumatoid nodules were also excluded. Primary cutaneous, soft-tissue, bone and cartilage neoplastic tumors and non-neoplastic tumor-like lesions were included. Secondary metastases (if found) were also searched for. For each collected case, the tissue was submitted in toto (if retrospectively was possible) and tissue sections from formalin-fixed, paraffin-embedded blocks were prepared. Sections of 4-6  $\mu\text{m}$  thickness were stained with routine hematoxylin and eosin (H&E) stain. Serial sections with multiple deeper levels for each block were performed. All H&E slides for each collected case were reviewed. Special stains, for example periodic acid Schiff (PAS), Alcian blue and colloidal iron, and immunohistochemistry (IHC) study for vimentin, smooth muscle actin (SMA), muscle specific actin (MSA), desmin, S100, CD34, CD31, ALK, CD68, epithelial membrane antigen (EMA), CEA and CK (AE1/AE3) were performed as directed by the examination of the H&E slides and as appropriate for the diagnosis of certain cases. The age, gender, the clinical data, the size, topography in relation to the hand regions, radiological studies (when available) and the surgical

\*Address corresponding to this author at the Pathology Section, Rashid Hospital, Oud Metha Road., Dubai, United Arab Emirates; Tel: 00971 4 219 5437; Fax: 00971 4 271 9340; E-mail: badraah009@yahoo.com

procedure for each case as well as follow up data (when available) were collected. The involvement of the hand by the lesions was topographically subdivided into phalangeal (fingers), metacarpal (palm and dorsum of hand) and carpal (wrist). Each region was subdivided into palmar (volar) and dorsal. The lesions were divided, according to the primary tissue involved into cutaneous, soft-tissue and skeletal (bone, cartilage and joints) and their related adnexal tissue, for example tendon sheaths and skin sweat glands.

## RESULTS

We found ninety-five tumors and tumor-like lesions that involved the hand and the wrist region. They covered a wide spectrum of variable lesions that involved the skin, its adnexa, the soft-tissue, tendon sheaths, joints, bones and cartilage. They included solid and cystic lesions. The age range was between 4 and 68 years with a mean age of 34 years. The male to female ratio was 47 to 48 (1:1). Follow up data were available for all the collected cases and it ranged between three months and four years. The cases had uneventful clinical follow up without recurrence after complete surgical resection, with the exception of one case of traumatic neuroma, which recurred 4 months after incomplete excision. The collected cases, their clinical and pathologic findings were tabulated for comparison (Table 1).

The three most common lesions were ganglions (ganglion pseudocysts/cysts), giant cell tumors of tendon sheath (GCT), endothelial tumors and vascular

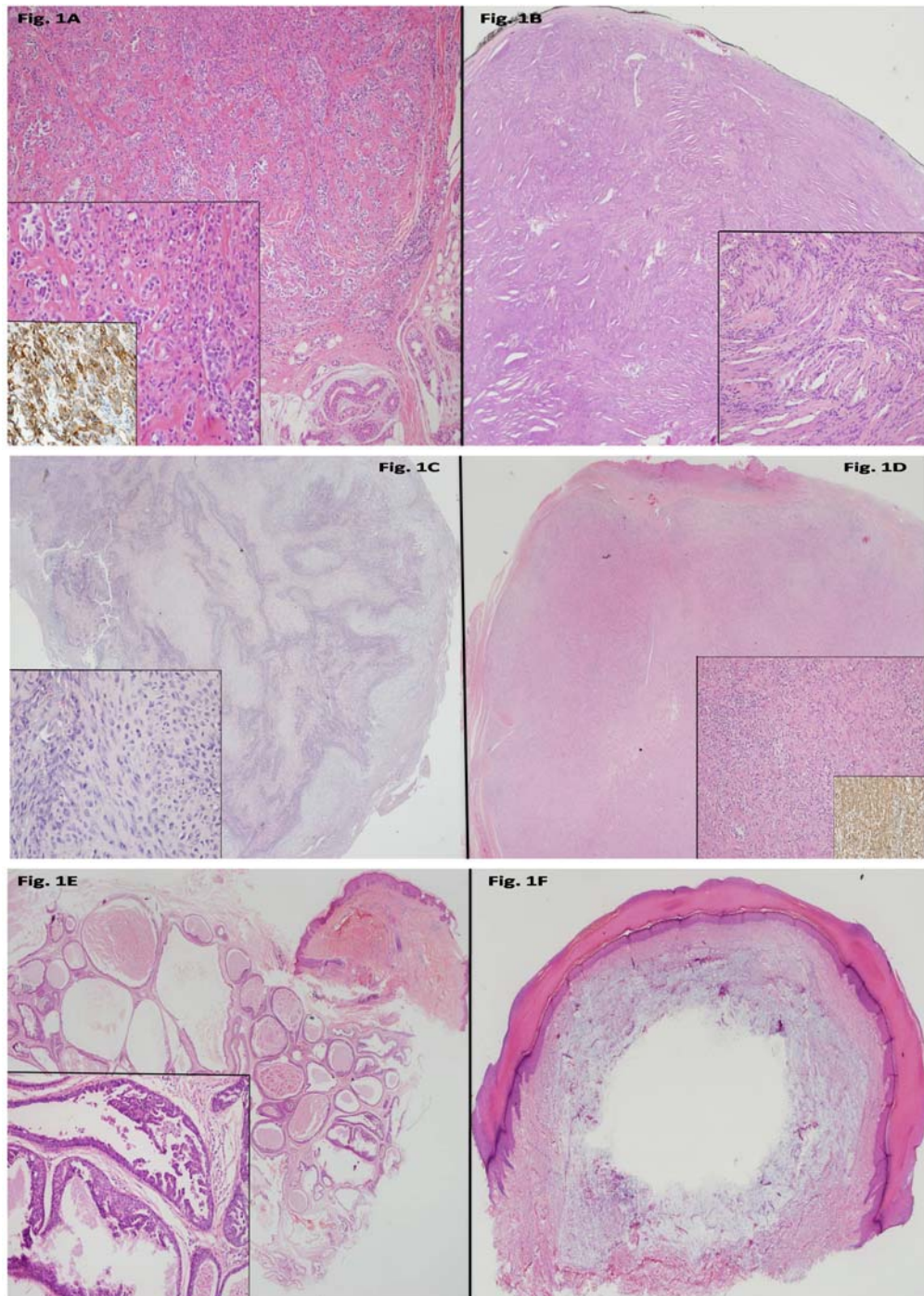
lesions. They collectively accounted for 67.6% of the hand lesions. Cysts, skeletal tumors, smooth muscle tumors and xanthomatous lesions were collectively the least common lesions to involve the hand with 8.2% occurrence. The size varied between 0.4 and 4.2 cm, but most were small lesions with an average size of 1.4 cm. The majority of the lesions have a particular tendency to involve the fingers and the wrist region. The fingers and the wrist accounted for 86% of involvement while the palm region was the least likely to be involved with 14% occurrence. The most commonly affected finger was the middle finger and the least was the little finger. Fourteen lesions involved the middle finger and three lesions involved the little finger. Nine lesions involved the index finger and seven lesions involved each of the ring finger and the thumb. The distribution between the left hand and the right hand was comparable with no significant differences. The ratio was 1.2:1. Dorsal lesions dominated over the volar lesions with 76 lesions involved the dorsal surface. The ratio was 5:1. This principally and significantly was noticed in the ganglions, GCTs of tendon sheaths, and vascular lesions, and to a lesser extent in the adipocytic and skeletal tumors. The neurogenic and cutaneous adnexal tumors showed more palmar localization.

Vascular lesions comprised three lobular capillary hemangiomas (pyogenic granulomas), three glomus tumors, two arteriovenous malformations, two hemangiomas (one Masson's and one acquired tufted) and one epithelioid hemangioendothelioma

**Table 1: Tumors and Pseudotumorous Lesions of the Hand, their Pathologic Classification, Clinical Features and Topographic Distribution**

Lesions N=95	n (%)	M: F	Age range (m) years	Size range (m) cm	P: M: C	Right: Left	Volar:Dorsal
Ganglion	37 (39)	22:15	4-68 (32)	0.5-2.5 (1.4)	2:1:34	14:23	1:36
GCT	16 (17)	7:9	18-67 (42)	0.7-2.2 (1.3)	15:1:0	9:7	0:16
Vascular	11 (11.6)	2:9	27-53 (35)	0.4-2.0 (1.0)	8:1:2	4:7	1:10
Fibro./Myofibro.	9 (9.5)	4:5	8-59 (37)	0.7-3.0 (1.8)	5:3:1	5:4	2:7
Neurogenic	6 (6.3)	2:4	20-51 (32)	0.4-1.3 (1.0)	4:1:1	4:2	5:1
Adipocytic	4 (4.2)	3:1	34-63 (48)	0.7-4.2 (2.4)	1:3:0	2:2	1:3
Skin Adnexal	4 (4.2)	1:3	12-38 (26)	0.7-1.7 (1.3)	1:2:1	2:2	3:1
Cysts	3 (3.1)	2:1	16-28 (21)	0.6-1.1 (0.8)	2:0:1	2:1	1:2
Skeletal	3 (3.1)	3:0	20-42 (30)	1.3-4.0 (2.4)	2:0:1	2:1	0:3
Others*	2 (2)	1:1	9-27	0.4- 0.5	0:2:0	1:1	1:1
All	95	47:48	4-68 (34)	0.4-4.2 (1.4)	40:13:41	44:51	16:79

N: Total number of lesions, n: number, (%): percentage, M: F: Male to Female ratio, (m): mean, P: M: C: Phalanx (fingers): Metacarpal (palm and dorsum of hand): Carpal (Wrist), GCT: Giant Cell Tumors of tendon sheath, Fibro. /Myofibro.: fibroblastic/myofibroblastic, \*: See text.



**Figure 1:** **A)** A well-defined tumor (epithelioid hemangioendothelioma) shows nests of plump neoplastic cells with prominent collagen bundles (Hematoxylin & Eosin stain, original magnification x100). Inset shows epithelioid cells, some with intracytoplasmic vacuoles, arranged in nests, cords and single cells (H&E stain, x400). CD31 (Dako) shows strongly positive neoplastic endothelial cells. **B)** A well-circumscribed nodule (fibroma of tendon sheath) shows characteristic slits (H&E stain, x20). Inset shows monotonous spindle cells arranged in intersecting bundles intervened by slits, hyalinized collagen matrix and blood vessels (H&E stain, x40). **C)** A well-delineated nodule (fibro-osseous pseudotumor) shows characteristic geographical zonation of darkly stained cellular areas and paler hypocellular areas with pink osteoid matrix in the center (H&E stain, original magnification x20). Inset shows a transition between the cellular spindle fibrous area and the pink osteoid area with plump osteoblast-like cells (H&E stain, original magnification x40). **D)** A well-defined mass (inflammatory myofibroblastic tumor) shows a nodular growth pattern (H&E stain, original magnification x20). Inset shows spindle cells with prominent background of lymphoplasmacytic inflammatory infiltrate (H&E stain, original magnification x200). SMA (Dako) shows strongly positive myofibroblastic cells (original magnification x200). **E)** A deep dermal to subcutaneous tumor (papillary eccrine carcinoma) shows microcysts and ducts with pink necrotic debris in the lumens (H&E stain, original magnification x20). Inset shows the lining epithelium with characteristic solid tufts and micropapillary projections (H&E stain, original magnification x200). **F)** A dermal-based mucinous cyst expanding the palmar skin into a polypoid nodule (H&E stain, original magnification).

(Figure 1A). Fibroblastic/myofibroblastic lesions included four fibromas of tendon sheath (Figure 1B), two dermatofibromas, one fibromatosis (Dupuytren's contracture), one fibro-osseous pseudotumor of the digit (Figure 1C) and one inflammatory myofibroblastic tumor (Figure 1D). Neurogenic lesions were three traumatic neuromas and three schwannomas. Adipocytic tumors were two lipomas, one angioliipoma and one fibrolipoma. Cutaneous adnexal tumors included two eccrine spiradenomas, one pilomatrixoma and one papillary eccrine carcinoma (Figure 1E). One epidermoid cyst, one synovial cyst and one mucous cyst (Figure 1F) constituted the cystic lesions. Skeletal lesions were one osteoid osteoma, one chondroma and a case of synovial osteochondromatosis. Other lesions included one leiomyoma and one juvenile xanthogranuloma. Forty-six true neoplastic tumors constituted 48.2% of the hand lesions. The majority were benign neoplasms. Malignant neoplasms were very rare. Two malignancies that included epithelioid hemangioendothelioma (Figure 1A) and papillary eccrine carcinoma of the digit (Figure 1E) accounted for 4.3% of the hand neoplasms and for 2.1% of the combined neoplastic and non-neoplastic hand lesions. These malignant tumors presented as slow-growing asymptomatic nodules and their clinical presentation ranged between two months and one year.

One young female patient presented with a synchronous occurrence of a ganglion of the left wrist and a traumatic neuroma of the left ring finger. The other lesions were solitary and sporadic. The majority of the lesions was asymptomatic and presented as nodules. The traumatic neuromas, glomus tumors, Masson's hemangioma, osteoid osteoma and eccrine spiradenomas were painful. Apart from two ganglions and one GCT, the remaining hand lesions were painless.

## DISCUSSION

The hand is the most highly functional part of the body. Therefore, trauma related tumor-like lesions are more likely to develop in the hand and wrist regions than any other part of the body with the possible exception of the feet, the lips and the oral cavity. Many hand lesions occur on other body parts, but the hand is unique in that these lesions could have different forms of presentations than on other body parts [4]. In addition, certain lesions are almost exclusive to the hand region, particularly the fingers. Therefore, their recognition should not elude the pathologists, specially the reactive sarcoma-like lesions, to misinterpret them

as sarcomas [8, 9]. The anatomy of the hand and fingers make joints, tendons and their related tissues, for example, tendon sheaths, so crowded in one region much more than any other body parts, except the feet, that the chance of lesions related to these structures are much more likely to occur in the hand. Similar findings could be found in the feet, but the spectrum of lesions is different and malignant tumors are more common in the foot than in the hand [9]. The majority of hand tumors are benign [1, 4-6]. Malignant non-cutaneous hand tumors are rare with an incidence between 1% and 2% [2, 3, 13]. Secondary metastases are uncommon with an overall incidence between 3% and 5% [3].

Ganglions are the commonest non-neoplastic lesions of the hand with a reported incidence between 50 and 74% [4, 14]. They predominantly involve the dorsum of the wrist. GCT of tendon sheath is the commonest neoplasm of the hand and the second most common lesion of the hand with an incidence of 3 to 9% [4-6, 15]. GCTs are more likely to recur than any other hand lesions with a recurrence rate between 10 and 40% [14]. Hemangiomas, particularly the trauma-related pyogenic granulomas, are the commonest vascular lesions to involve the hand and are the fourth commonest hand tumors with a prevalence of 2 to 6% [4]. Vascular lesions usually involve the fingers and are often painful or tender, in particular the glomus tumors [4-6]. Malignant endothelial tumors are rarer and usually include Kaposi's sarcoma and hemangioendothelioma [3]. Angiosarcomas are unlikely to involve the hand [3]. Fibroblastic and myofibroblastic connective tissue lesions are the most variable group with a wider spectrum of lesions than any other types [2-4, 16]. Some are peculiar to the hand, for example fibroma of tendon sheath, juvenile aponeurotic fibroma and infantile digital fibromatosis [4]. Other reactive benign lesions, for example nodular fasciitis and its variants, myositis ossificans and fibro-osseous pseudotumor (Figure 1C) can present diagnostic difficulties for the unwary pathologists since they can mimic sarcomas [2, 8]. Traumatic neuromas are the commonest neurogenic lesions [4-6, 17]. Schwannomas are the most common neurogenic tumors followed by neurofibromas [4-6, 17]. Even though lipomas are the commonest mesenchymal soft-tissue tumors of the body, they are not as common in the hand region [5, 6]. They constitute 1 to 3% of hand tumors [4]. They are principally dorsal lesions and can reach a noticeable size in comparison to other hand lesions since they are slow-growing asymptomatic

lesions [4]. Cutaneous adnexal tumors are not common in the hand [3]. They are mostly represented by eccrine sweat gland tumors and usually are palmar [3]. Although of the paucity of eccrine tumors on the hand, 11 to 14% of malignant eccrine tumors do occur on the hand [3]. Epidermoid cysts are the most frequent cysts that involve the hand and comprise 4 to 14% of hand lesions [4, 10, 11]. They tend to occur in the volar surface of the fingers and palm [4, 5]. They either originate secondary to traumatic implantation or due to occlusion defects along embryonal planes [4, 6]. Mucous cysts are less common than epidermoid cysts, but are at higher risk of post-operative complications and recurrence [5, 6, 13]. They are related to osteoarthritic changes and osteophytes or result from herniation of joint lining [4]. Some consider them as pseudoganglions since they are the result of myxoid degeneration due to trauma, but are digital and do not involve the wrist in contrast to the true ganglions [4]. Synovial cysts are much less frequent and are the results of herniation of the synovial membrane of the joints [11]. Bone and cartilage tumors are usually benign when involving the hand [18]. The majority (60%) are cartilaginous tumors and 72% are enchondromas [6, 9]. Extrasketal soft-tissue chondromas occur mostly in extremities especially the hands [11]. Chondrosarcomas are the most common primary bone malignancies of the hand [2, 9]. Smooth muscle tumors are rare in the hand. Most are cutaneous leiomyomas or angioleiomyomas [4].

Malignant non-epithelial hand tumors are rare and exceptional in the hand that the possibility of metastasis or potential benign mimickers should be considered [9]. Reactive pseudosarcomatous lesions, for example myositis ossificans and fibro-osseous pseudotumor of the digit should be considered before disposing a mesenchymal hand tumor as malignant [8, 9]. The commonest primary malignant hand tumors are epithelial tumors particularly squamous cell carcinoma [2, 3, 5, 16, 19]. The most common non-epithelial mesenchymal malignancies are epithelioid sarcomas [3]. Others include dermatofibrosarcomas, synovial sarcomas and vascular tumors [3].

Some hand lesions can simulate malignancies and knowledge of the different types of these lesions that commonly affect the hand help pathologists in their recognition as pseudosarcomatous benign lesions. The presence of high mitotic rate, hypercellularity, and mild atypia may elude the pathologists to diagnose these lesions as sarcomas. The fact that hand lesions are usually well defined with round pushing rather than

infiltrative borders and tend to have a lobular growth pattern with geographic zonation effect (Figures **1B** and **1C**) are good clues to the benign nature of these lesions. These reactive lesions are commonly mitotically active and this high mitotic activity is alarming for the unwary pathologists, but the other architectural features should be considered. For example, in our study, the fibro-osseous pseudotumor of the digit (Figure **1C**) imposed a diagnostic difficulty and was initially misinterpreted as osteosarcoma.

Our study confirmed the findings of other studies in that most of the hands lesions were benign tumor-like lesions and most were trauma-related [1-7, 9, 11, 13-15]. True neoplastic tumors were predominantly benign [1-7, 9, 11, 13-15]. One study, however, pointed out that there is a dramatic change in the occurrence of single hand tumors and that tumor-like lesions are on the decline while malignant tumors are becoming a common occurrence [19]. Our study however showed few, but notable differences, compared with the other studies. We did not identify skin malignancies, for example squamous cell carcinoma and melanoma in our study. This is in contrast to the other series studies, which reported a higher incidence of these tumors in the hand [2-4, 16, 19]. This in part, we believe, because the reported series were in developed countries in the West where fair-skinned people are more prone to develop such tumors in sun-exposed areas such as the hands, while our darker-skinned population are less likely to develop sun exposure-related skin malignancies. In addition, the level of the hospitals that is general versus specialty referral hospitals, in which the studies were conducted may affect the reported prevalence of hand cutaneous malignancies [5, 6]. The specialty and the interest of the clinicians, for example dermatologists, orthopedic hand surgeons, general surgeons or radiologists, conducting the studies on hand lesions, may also affect the spectrum and the predominant types of hand lesions depending on the referred cases [1-6, 10-12, 18, 19]. Our study is not without limitations because it was based on a single general practice institute which limits the conclusions. For example, the younger population in our study compared to other studies could be due to the fact that countries with older patients could have different distributions of tumor types.

In conclusion, a vast array of different types of neoplasms and tumor-like lesions involve the hand. Most are easily recognized by histologic examination and pose no diagnostic challenges. Other rarer, particularly soft-tissue tumor-like lesions, however, can



impose diagnostic pitfalls for the unwary pathologists. They are commonly confused with sarcomas. Awareness of the spectrum of hand lesions, their histoarchitectural features and the fact that most hand lesions are benign should help avoid this misdiagnosis.

## REFERENCES

- [1] Plate IS, Lee SJ, Steiner G, *et al.* Tumorlike lesions and benign tumors of the hand and wrist. *J Am Acad Orthop Surg* 2003; 11: 129-41.
- [2] Plate AM, Steiner G, Posner MA. Malignant tumors of the hand and wrist. *J Am Acad Orthop Surg* 2006; 14: 680-92.
- [3] Sobanko JF, Dagum AB, Davis IC, *et al.* Soft tissue tumors of the hand. 2. Malignant. *Dermatol Surg* 2007; 33: 771-785. <http://dx.doi.org/10.1111/j.1524-4725.2007.33170.x>
- [4] Sobanko JF, Dagum AB, Davis IC, *et al.* Soft tissue tumors of the hand. 1. Benign. *Dermatol Surg* 2007; 33: 651-67. <http://dx.doi.org/10.1111/j.1524-4725.2007.33140.x>
- [5] Stack HG. Tumours of the Hand. *Postgrad Med J* 1964; 40: 290-98. <http://dx.doi.org/10.1136/pgmj.40.463.290>
- [6] Stack HG. Tumors of the hand. *Br Med J* 1960; 1: 919-22. <http://dx.doi.org/10.1136/bmj.1.5177.919>
- [7] Shapiro PS, Seitz WH Jr. Non-neoplastic tumors of the hand and upper extremity. *Hand Clin* 1995; 11: 133-60.
- [8] de Silva MV, Reid R. Myositis ossificans and fibroosseous pseudotumor of digits: a clinicopathological review of 64 cases with emphasis on diagnostic pitfalls. *Int J Surg Pathol* 2003; 11: 187-95. <http://dx.doi.org/10.1177/106689690301100305>
- [9] Jiang ZM, Zhang HZ, Chen JQ, *et al.* Clinicopathologic analysis of 154 cases of tumors and tumor-like lesions in the bones of hands and feet. *Zhonghua Bing Li Xue Za Zhi* 2003; 32(5): 417-421. [Abstract].
- [10] Ergun T, Lakadamyali H, Derincek A, *et al.* Magnetic resonance imaging in the visualization of benign tumors and tumor-like lesions of hand and wrist. *Curr Probl Diagn Radiol* 2010; 39: 1-16. <http://dx.doi.org/10.1067/j.cpradiol.2009.01.002>
- [11] Horcajadas AB, Lafuente JL, de la Cruz Burgos R, *et al.* Ultrasound and MR findings in tumor and tumor-like lesions of the fingers. *Eur Radiol* 2003; 13: 672-85.
- [12] Theumann N, Baur A, Hauger O, *et al.* Imaging of tumors and tumor-like diseases of the hand. *Rev Med Suisse* 2005; 1(46): 2983-88.[Abstract].
- [13] Johnson J, Kilgore E, Newmeyer W. Tumorous lesions of the hand. *J Hand Surg Am* 1985; 10: 284-286.
- [14] Nahra ME, Bucchieri JS. Ganglion cysts and other tumor related conditions of the hand and wrist. *Hand Clin* 2004; 20: 249-60. <http://dx.doi.org/10.1016/j.hcl.2004.03.015>
- [15] Jozsa L, Renner A. Tumors and tumor-like lesions arising in tendons. A clinicopathological study of 75 cases. *Arch Orthop Trauma Surg* 1991; 110: 83-86.
- [16] Geldmacher J, Flugel M. Tumors and tumor-like lesions of the hand. *Handchirurgie* 1977; 9(2): 97-103. [Abstract].
- [17] Forthman CL, Blazar PE. Nerve tumors of the hand and upper extremity. *Hand Clin* 2004; 20: 233-42. <http://dx.doi.org/10.1016/j.hcl.2004.03.003>
- [18] Besser E, Roessner A, Brug E, *et al.* Bone tumors of the hand. A review of 300 cases documented in the Westphalian Bone Tumor Register. *Arch Orthop Trauma Surg* 1987; 106: 241-47. <http://dx.doi.org/10.1007/BF00450462>
- [19] Grunert JG, Jakubietz MG, Jakubietz RG. Tumors of the hand - results of a long- term study. *Handchir Mikrochir Plast Chir* 2004; 36: 289-295. [Abstract].