Review of Histology results of Hand Masses seen at The Chris Hani Baragwanath Academic Hospital Hand Unit in Johannesburg South Africa.

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of

Master of Medicine

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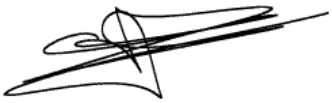
Declaration

I Dr Christian Vyamungu declare that this research report is my own, unaided work. It is submitted for the Degree of Master of Medicine in the Division of Plastic Surgery at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

……  ……

(Signature of candidate)

…3rd …day of …March.……2021……...in Johannesburg……

Co- authors Declaration

The Postgraduate office,

Faculty of Health Sciences

University of the Witwatersrand

Dear Sir/ Madam

We the undersigned, acknowledge Dr C. Vyamungu as the first author of this work titled **"Review of Histology of Hand Masses seen at The Chris Hani Baragwanath Academic Hospital Hand Unit in Johannesburg South Africa"** and give permission for its submission for the degree of MMed at the University of the Witwatersrand. The candidate significantly contributed to the protocol development, data collection, analysis and interpretation, writing, revising and approval of the final submissible version of the paper.

Please give him the assistance he requires.

Yours sincerely.

T. Sefeane..... Date.....26/02/2020

C.Sathekga ..... Date.....26/02/2020

P.Fru..... Date.....25/02/2020

E. Ndobe..... Date.....25/02/2020

Dedication

To my mother Domitille who taught me to be self-reliant, my wife Thibby and my children Muco and Matshela for allowing me to be away from them while I pursue my studies, my mother-in-law for looking after our kids, my brothers and sisters wherever you are.

In memory of my brother Nassor.

Presentations and publications arising from the research project

The report has been submitted to Annals of African Surgery and has been published online under this link. https://www.annalsofafricansurgery.com/online-first . This study was presented at The Bert Myburgh Research Forum on the 25th of November 2020.

Abstract

Introduction: Patients with hand masses present for consultation either for pain, loss of function, or cosmetic embarrassment caused by the mass. The majority of hand masses are benign soft tissue tumors. Our aim was to review the histology results of hand masses operated on at the Chris Hani Baragwanath Academic Hospital Hand Unit in Johannesburg, South Africa, to explore the relationship of the types of masses according to age, sex, side, and compare the findings with what is in the current literature.

Methods: All patients operated on in the hand unit, for hand masses between April 2016 and April 2019 with histology results were included in the study for statistical analysis.

Results: There were 64 males and 105 females with a mean age of 41.03 ± 18.81 years. The most frequent masses were ganglion cysts. Females appeared to be more affected than males by the different hand masses, but there were no statistically significant differences except with the 21 giant cell tumors, where 15 occurred on the right hand (*p*-value = 0.021).

Conclusion: The profile of hand masses at a high-volume hand unit in Johannesburg, were comparable to the reported literature. There were no significant differences between sex and diagnosis, however, there was a relationship between diagnosis and side for giant cell tumors of tendon sheaths, requiring further exploration.

Keywords: Hand masses, hand tumor, ganglion cyst, giant cell tumor

Acknowledgements

I would also like to thank Dr Dismas Ntirampeba for input in statistics.

This Research Report was written following the guidelines for Publication in The Annals of African Surgery Journal.

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List of Abbreviations

DWG: Dorsal Wrist Ganglion

GC: Ganglion Cyst

GCs: Ganglion Cysts

GCT: Giant Cell Tumor

GCTs: Giant Cell Tumors

VWG: Volar Wrist Ganglion

Introduction

Hand masses account for some of the conditions presenting to a healthcare practitioner working in a hand unit (1). Most patients who present do so either because of pain and limited hand function caused by the mass or due to aesthetic concerns.

The majority of hand masses are benign, and ganglion cysts (GCs) are the most common, followed by the giant cell tumors of tendon sheaths (GCTs), and lipomas (1–3). The hand masses may compress the surrounding tissues such as nerves or blood vessels and this can result in carpal tunnel syndrome or Guyon's canal syndrome due to the compression of the median or ulnar nerve, respectively (4, 5). Even though malignant hand masses are rare, they can be devastating and generally result in amputation of a digit or the whole hand involved (1, 2).

Hand tumors and tumor-like conditions can arise from the soft tissues or from the bones (1, 6). The soft tissues involved can be skin and adnexa, fat, nerves, blood vessels, and tendon sheaths (6). Cavit et al. (1) reviewed 402 cases of hand tumors and found that 89.8% of cases were soft tissue tumors while 10.2% were bone tumors. There was a female preponderance with an average age of 41.9 years. However, most studies have reported on the frequency of the different masses with only a few reporting on the statistical difference with regard to sex or side of the hand. With regard to hand masses of bony origin, enchondromas are the most frequent masses whilst malignant bone lesions are very rare (2). Besides clinical assessment, special investigations include X-rays, ultrasound, computed tomography, and magnetic resonance imaging scans (6). Treatment of hand masses ranges from observation to surgical excision, the latter being the definitive treatment form (2). There was a need to look at the local profile of hand masses at a high-volume hand unit in Johannesburg, South Africa, and to compare the findings with that of existing literature. This review of records will serve as an additional tool for the teaching of hand tumor management, as well as serving as a reference to advocate for resource allocation to the hand unit as a teaching institution.

The study aimed to review the histology results of hand masses that were operated on at the Chris Hani Baragwanath Academic Hospital Hand Unit theatre over a 37-month period from April 2016–April 2019, and to review the types of hand masses according to age, sex, and side of the hand, and to compare the findings with what is available in the current literature.

Methods

Permission to conduct this study was granted by both the Chris Hani Baragwanath Hospital Ethics Committee and the Wits Human Research Ethics Committee with clearance certificate number M191049.This is a retrospective quantitative audit that analyzed the histology results of patients operated on for masses of the hand at the Hand Unit. All patients operated on from April 2016 to April 2019 and the histology results were included in this study. To obtain data as complete as possible, the Hand Unit theatre register and the registrar theatre database were used to acquire the histology results, age, sex of the patients, and information on the side of the hand that the mass occurred on. All cases were operated on under regional anesthesia except for an 8-month-old patient. The specimens were placed in 10% formalin solution for histopathological processing and diagnosis. Paraffin-embedding of the tissue occurred and 3-μm tissue sections were prepared for hematoxylin and eosin (H&E) staining and immunohistochemistry. Diagnoses were based on the World Health Organization (WHO) classification of tumors of soft tissues and bone (7). Histopathological reporting of the malignant cases was aligned with international cancer protocol templates. The hand was defined as the part of the upper limb from the wrist down to the tip of the digits, the dorsum as the extensor surface, and the volar area as the flexor surface.

All data was entered into an Excel software (Microsoft Corporation, Redmond, WA, USA) spreadsheet and exported to Statistica software (Statsoft Inc, Dell, Tulsa, OK, USA) for statistical analysis. The mean ± standard deviation (SD) and percentages for the quantitative and categorical data were reported, respectively. The chi-square (χ^2) test was used to test the relationship between the variables. A *p*-value less than 0.05 was considered significant. Dependent variables were the histologic types of masses, and the independent variables included age, sex, and side.

Results

A total of 169 histology results of hand masses from 169 patients were included in this study. Of all the patients, 105 (62.13%) were females and 64 (37.87%) were males. The mean age of patients was 41.03 ± 18.81 years, the median age was 40 years, and the age range was 8 months to 88 years. The mean age of female patients was 41.62 ± 18.28 years with a median of 40 years, and the mean age of male patients was 40.04 ± 19.76 years with a median of 39 years. Of the 169 cases, 80 (47.34%) were on the right side and 89 (52.66%) on the left side. Soft

tissue hand masses accounted for 163 (96.45%) of cases, whilst six (3.55%) cases were of bone origin. Of the total number of cases, 162 (95.86%) of the hand masses were benign and seven (4.14%) were malignant.

The most frequent hand tumors amounted to 39 (23.08%) GCs, followed by 21 (12.43%) cases of GCTs, 21 (12.43%) pyogenic granulomas, 15 (8.87%) cases of lipoma, 13 (7.69%) cases of synovitis, and 12 (7.10%) cases of hemangioma. The remaining cases consisted of a mix of soft and bony tissue tumors and amounted to 48 (28.40%) cases.

With regard to soft tissue tumors, 13/39 (33.3%) of the GCs cases were males and 17/39 (43.6%) cases were on the right side, whilst 22/39 (56.4%) were on the left side. Thirty-two (82.05%) of the GCs cases were on the wrist comprising 15/32 dorsal wrist ganglions (DWGs), and17 volar wrist ganglions (VWGs). The mean age of patients with GCs was 39.18 ± 19.45 years with a median of 35 years. Fifteen GCTs involved the right side and six cases were on the left side, and the sex distribution was six males and 15 females. Most of the digits involved with the GCTs entailed the thumb and index finger with six and five cases, respectively. The mean age of patients was 39.52 ± 15.99 years with a median of 38 years. For the 15 cases of lipoma, six were on the right hand and nine were on the left affecting 12 females and three males in total. The mean age of patients was 52.8 ± 15.51 years with a median of 56 years for these patients. The 21granuloma cases were found in eight males and 13 females, 11 of which were on the right whilst 10 cases were on the left. The mean age of patients was 32.19 ± 19.30 years with a median of 29 years.

With regard to malignant soft tissue tumors, there were three cases (1.69%) of soft tissue sarcomas, consisting of one synovial sarcoma, one Kaposi's sarcoma, and one fibroblastic sarcoma. These were all on the left hand and affected only males. The rest of the malignant soft tissue masses consisted of two cases of squamous cell carcinoma in a male and one porocarcinoma involving a female patient. The mean age of patients with malignant soft tissue masses was 44.16 ± 15.68 years with a median of 43.5 years.

Nine of the hand tumor-like conditions were synovitis of inflammatory origin whilst four cases were due to tuberculosis with a positive acid-fast bacilli test. The mean age of patients was 43.15 ± 17.23 years, and the median was 40 years.

The tumors of bone origin comprised two enchondromas, two osteochondromas, one case of myelofibrosis, and only one case of an Ewing sarcoma (EWS). The mean age of patients was 46.33 ± 21.51 years with a median of 49 years.

The statistical analysis of the relationship between sex and diagnosis revealed that only the GCT was significantly related with side (p-value = 0.021), with 71.4% of cases diagnosed on the right side of the hand. The rest of the diagnosis results did not show any significant relationship with side (p-value > 0.05). A χ^2test of association was also conducted to assess whether the diagnosis differed by sex. There was no significant relationship between diagnosis and sex as all the diagnoses had a p-value greater than 0.05 when cross tabulated with the patient's sex. Among the 32 wrist ganglions there was no statistical difference with regard to their location (p-value = 0.7237).

Discussion

Our study found that the majority of hand masses were from soft tissues, and very few cases were malignant. As in other studies, hand masses predominantly comprised GCs, GCTs, granulomas hemangiomas, and lipomas (6). In the study by Cavit et al. (1), 402 cases of hand masses were reported, 97.5% of which were benign lesions, and 2.5% were malignant. Their study showed a female predominance with a mean age of 41.9 years. The authors also found that GCs were the predominant masses and that these were mostly found on the wrist (1). However, they did not test the sex difference statistically. Our study revealed similar trends with most of the hand masses being benign whilst very few cases were malignant. The mean age in our study was similar to what has already been published and confirmed that most hand masses presented during the second to fourth decade of life; however, the difference in sex presentation was not statistically significant. In keeping with the literature, the GCs were the most frequent hand masses and were located mainly on the wrist, although any joint can be involved (6, 8). No association between the diagnosis and sex or between diagnosis and sides of the hand involved was found. In contrast to the findings of a retrospective statistical analysis of 520 cases of GCs of the hand and wrist, by Kuliński et al. (9), where there was a predominance of DWG compared to VWG, we did not find a statistically significant difference between the two.

Our study findings confirm the fact that the GCs generally occur between the second and fourth decade of life (1). Kuliński et al. (9), found a female to male ratio of 2.8:1, but there was no statistically significant difference between females and males in terms of occurrence of the GCs in particular locations. Similarly, we found no statistical difference between the sexes.

GCT was our second most common type of tumor and this presents as a soft tissue mass that develops over a long period, sometimes up to many years (10, 11). Even though it is a benign lesion with only a few malignant lesions reported, it is however, known for its local destructive ability (2) (see Figure 1A, B). In general, the GCTs are characterized by an increased recurrence rate (7–29%) (2). As in previous studies, our study showed the GCT as the second most common type of hand mass, with a female preponderance but with no statistically significant difference between the sexes. The thumb and index fingers were the most commonly involved sites. Darwish et al. (12) found that the thumb was the most affected digit followed by the index finger, however, there was no explanation for this location. Similar to our study, the female-to-male ratio was 2:1 (12). Al-Qattan (10) however, found that the index finger and middle fingers were the most involved in GCTs in a Saudi Arabian study. We found that there was a statistically significant difference between the sides, with more lesions found on the right side, a finding also reported by Tang et al. (13) in a study in Singapore. They found that 9/11(81%) cases of GCTs occurred on the right side of the hand, although this was not statistically tested. Furthermore, most GCTs involved the index finger and the thumb was spared. This is in contrast with the findings regarding the thumb and index fingers as the main location of GCTs in our study. This laterality of GCTs needs to be explored further with a sample number bigger than the 21 cases reported in our study.

Lipomas are clinically important tumors as they can mimic a soft tissue sarcoma, which if missed can be disastrous for the patient (see figure 2A, B). Any part of the body where adipose tissue is present can be involved (3). Lipomas usually grow slowly and are often of a large size at presentation; however, if the growth is rapid, leading to a large size with pain, this should raise suspicion of a malignant lesion (4, 14). Such lesions can cause compression of vital structures such as the median nerve leading to carpal tunnel syndrome, or the ulnar nerve in the Guyon canal resulting in the development of lower ulnar nerve palsy (1, 3, 4). The mean age for our patients with lipomas was slightly higher than the mean age for all the patients with hand masses. Cavit et al. (1) reported a similar mean age of 51.3 years. This late presentation might be due to the painless nature and slow growth of lipomas. There was no relationship between sex and diagnosis or between side and diagnosis.

The tumor-like conditions found were synovitis resulting from tuberculosis and inflammatory conditions. These are often not considered as tumors, however, patients with tuberculous synovitis can present with localized or diffuse swelling on the dorsum of the wrist. Coulibaly et al. (15) reported on four cases of tuberculous tenosynovitis of the wrist and hand, where one

of their patients had a tuberculous mass on the palmar aspect of the hand with signs of median nerve compression. We also found four cases of tuberculous tenosynovitis of the hand and this diagnosis with diffuse swelling of the wrist must be considered, especially with a background of immunosuppression. The differential diagnosis includes many inflammatory conditions but can also mimic an EWS (16). The isolation of the organism from synovial fluid or synovial biopsy forms the basis of the definitive diagnosis (16).

Notwithstanding the fact that the glomus tumor comprises only 1.18% (2/169) of our cases, it has a very significant impact on the affected digit. It is a painful benign tumor from the modified smooth muscles of the glomus body with a slow growth (17). The usual clinical presentation is a solitary nodule in the nail bed that is extremely painful on touching or exposure to cold in the fingertip. Treatment is by meticulous surgical excision with partial removal of the nail to avoid recurrence (18).

With regard to bone masses, most were enchondromas, as in reported studies where the majority were enchondromas representing from 30% to 60% of all bone tumors of the hand (1, 19). These benign masses are intramedullary hamartomas, originating from aberrant germs of cartilage, and are composed of well-differentiated hyaline cartilage (19–21). Enchondromas are usually solitary masses often found in the proximal phalanx followed by the metacarpals, but can present as multiple lesions as in Ollier's disease and Maffucci syndrome (20). One of our cases had Ollier's disease (Figure 3). Most patients present with swelling and pain, or a pathological fracture of the digit involved (20). Definitive treatment is surgical curettage combined with a variety of ways to deal with the resultant cavity (19). Options include leaving the cavity to heal by secondary intention or using bone grafts to fill the cavity (19, 21). Chondrosarcomas are the most common malignant bone tumors occurring in the hand and can result from malignant transformation of enchondromas in patients with Maffucci syndrome (2, 20, 21). Very few cases of malignant bone lesions of the hand are mentioned in the literature, and our study found only one case of EWS. EWS of the hand is relatively rare and presents with pain, swelling, a mass, or with clinical features of infection with fever and elevated inflammatory markers (22). These signs could be confused with a case of tuberculous tenosynovitis in regions where tuberculosis is endemic (22). Proper biopsy-guided management is of the utmost importance. Definitive treatment is generally a combination of surgery with ray amputation of a digit and adjuvant chemotherapy.

The weakness of this study is in its retrospective nature, with small sample size. Patient selection eliminated cases diagnosed clinically and managed in the outpatient clinic.

Conclusion

This study shows that the profile of patients with hand masses from a high-volume hand unit in Johannesburg is similar to what is reported in the literature. Most hand masses in this study were benign soft tissue tumors and GC was the most common type of hand mass, with the majority of patients presenting during the second to fourth decade of life. While no association was found between the diagnosis and sex, or side and diagnosis, it was notable that in the case of GCT there was a significant difference in distribution in favor of the right side of the hand, a finding which needs to be further explored.

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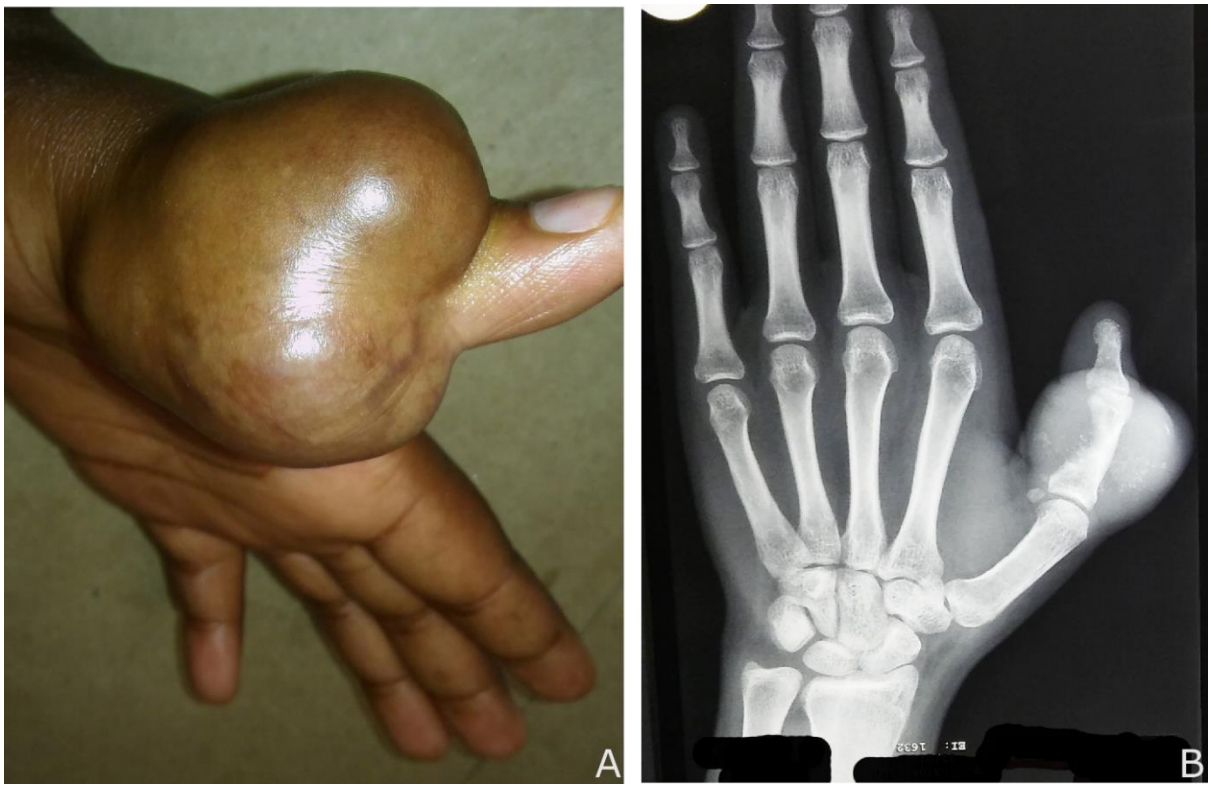

Figure 1 A, B: A giant cell tumor of the left thumb (A) with erosion of the proximal phalanx on an anteroposterior X-ray view.

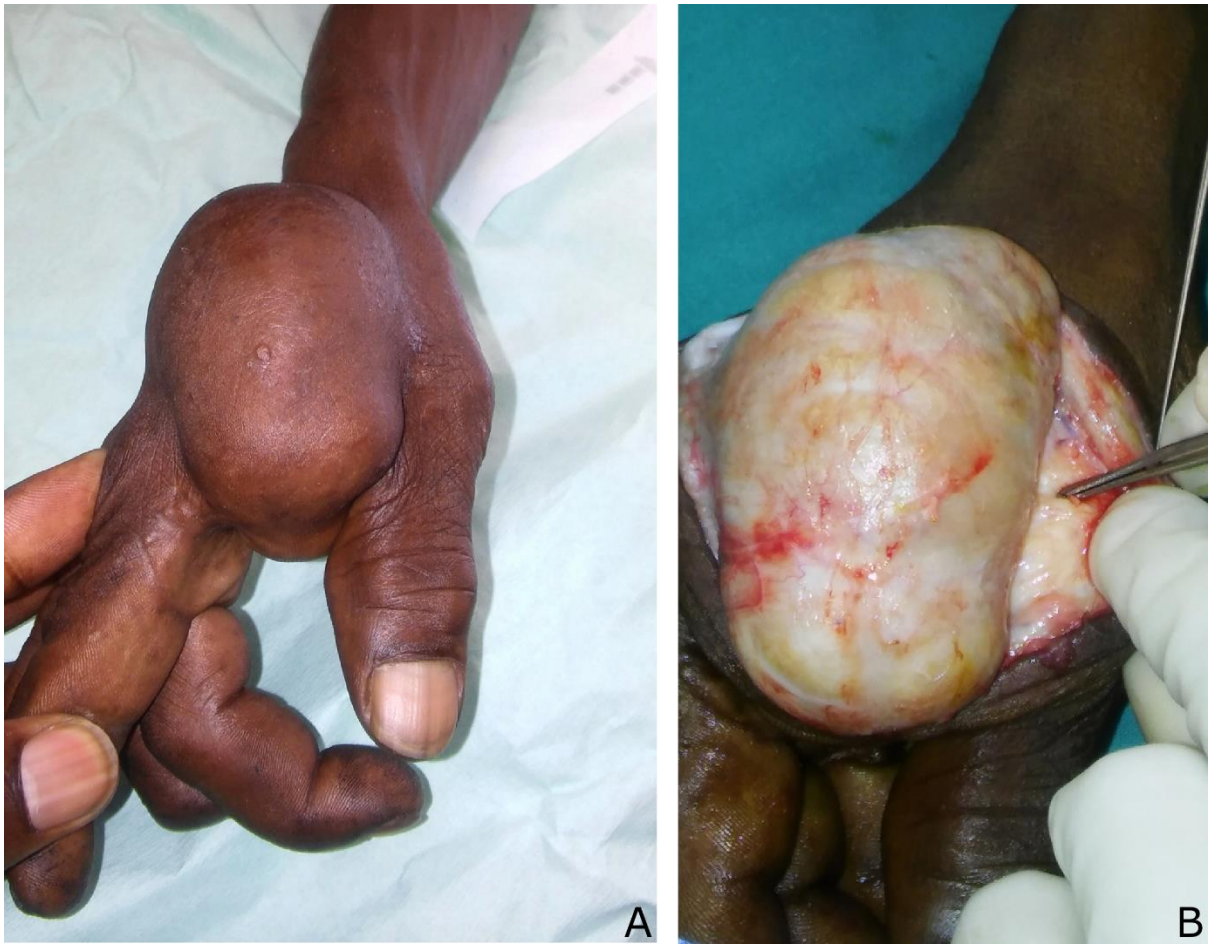

Figure 2 A, B: A lipoma of the right first webspace (A) and an intraoperative view (B)

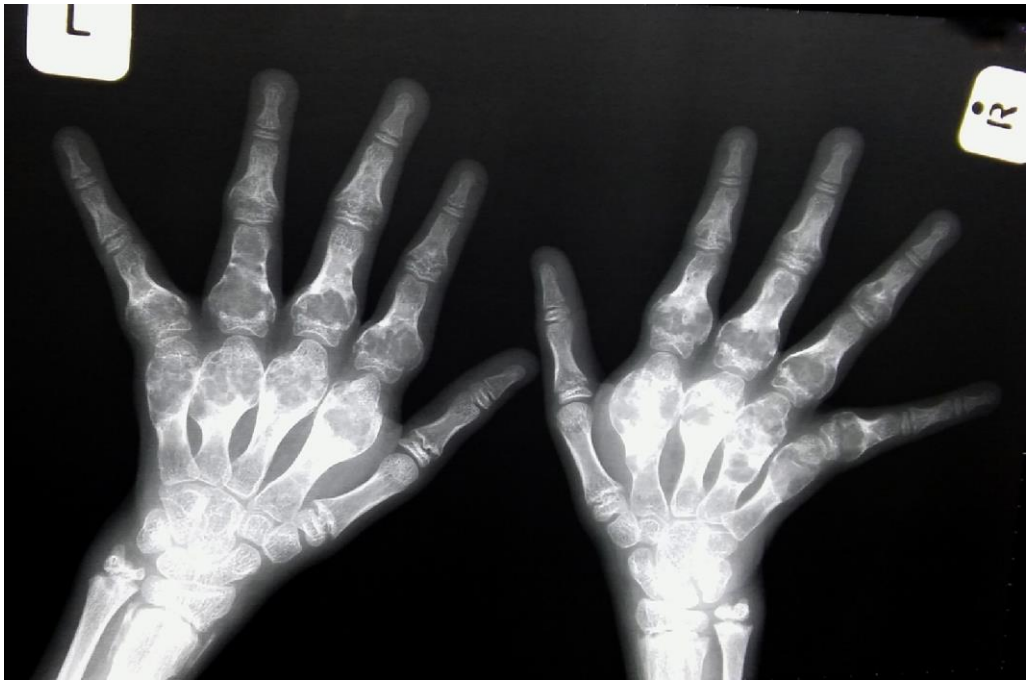

Figure 3: Anteroposterior radiological view of the right and left hands showing multiple enchondromas in a case of Ollier disease

Appendices

Appendix A:

Table 1: Demographics and hand mass histology distribution by Sex

	SEX		Total	P-value
	Male	Female		
Ganglion	13 (33.3%)	26 (66.7%)	39 (100%)	0.575
Lipoma	3 (20%)	12 (80%)	15 (100%)	0.169
Hemangioma	5 (41.7%)	7 (58.3%)	12 (100%)	0.767
Schwanomma	0 (0%)	4 (100%)	4 (100%)	0.299
Neurofibroma	2 (66.7%)	1 (33.3%)	3 (100%)	0.558
Glomus tumor	0 (0%)	1 (100%)	1 (100%)	1.000
Giant cell tumor	6 (28.6%)	15 (71.4%)	21 (100%)	0.472
Synovitis	6 (46.2%)	7 (53.8%)	13 (100%)	0.560
Fibroma	3 (75%)	1 (25%)	4 (100%)	0.153
Granuloma	8 (38.1%)	13 (61.9%)	21 (100%)	1.000
Soft tissue sarcoma	3 (100%)	0 (0%)	3 (100%)	0.053
Porocarcinoma	0 (0%)	1 (100%)	1 (100%)	1.000
Enchondroma	1 (50%)	1 (50%)	2 (100%)	1.000
Epidermal cyst	4 (80%)	1 (20%)	5 (100%)	0.069
Gout	1 (50%)	1 (50%)	2 (100%)	1.000
Leiomyoma	0 (0%)	1 (100%)	1 (100%)	1.000
Fibromyxoma	1 (100%)	0 (0%)	1 (100%)	0.379
Warts	1 (33.3%)	2 (66.7%)	3 (100%)	1.000
SCC	2 (100%)	0 (0%)	2 (100%)	0.142
Osteochondroma	0 (0%)	3 (100%)	3 (100%)	0.290
Calcinosis cutis	0 (0%)	2 (100%)	2 (100%)	0.527
Palmar fibrosis	1 (50%)	1 (50%)	2 (100%)	1.000
Spindle cell proliferation	1 (100%)	0 (0%)	1 (100%)	0.379
Myelofibrosis	1 (100%)	0 (0%)	1 (100%)	0.379
Cystic hidradenoma	0 (0%)	1 (100%)	1 (100%)	1.000
Digital papillary adenoma	1 (100%)	0 (0%)	1 (100%)	0.379
Fibrokeratoma	0 (0%)	1 (100%)	1 (100%)	1.000
Seborrheic keratitis	0 (0%)	1 (100%)	1 (100%)	1.000
Erythema elevatum	0 (0%)	1 (100%)	1 (100%)	1.000
Botryomycosis	0 (0%)	1 (100%)	1 (100%)	1.000
Keratinous debris	1 (100%)	0 (0%)	1 (100%)	0.379

Appendix B

Table 2: Demographics and hand mass histology distribution by side.

DIAGNOSIS	Number	SIDE		P-value
		Right (n=80)	Left (n=89	
Ganglion cyst	39	17 (43.6%)	22 (56.4%)	0.715
Lipoma	15	6 (40%)	9 (60%)	0.599
Hemangioma	12	3 (25%)	9 (75%)	0.138
Schwanomma	4	1 (25%)	3 (75%)	0.623
Neurofibroma	3	1 (33.3%)	2 (66.7%)	1.000
Glomus tumor	1	0 (0%)	1 (100%)	1.000
Giant cell tumor	**21**	**15 (71.4%)**	**6 (28.6%)**	**0.021**
Synovitis	13	8 (61.5%)	5 (38.5%)	0.388
Fibroma	4	2 (50%)	2 (50%)	1.000
Granuloma	21	11 (52.4%)	10 (47.6%)	0.648
Soft tissue sarcoma	3	0 (0%)	3 (100%)	0.248
Porocarcinoma	1	1 (100%)	0 (0%)	0.473
Enchondroma	2	1 (50%)	1 (50%)	1.000
Epidermal cyst	5	1 (20%)	4 (80%)	0.371
Gout	2	2 (100%)	0 (0%)	0.223
Leiomyoma	1	0 (0%)	1 (100%)	1.000
Fibromyxoma	1	1 (100%)	0 (0%)	0.473
Warts	3	1 (33.3%)	2 (66.7%)	1.000
Squamous cell carcinoma	2	1 (50%)	1 (50%)	1.000
Osteochondroma	3	2 (66.7%)	1 (33.3%)	0.604
Calcinosis cutis	2	2 (100%)	0 (0%)	0.223
Palmar fibrosis	2	1 (50%)	1 (50%)	1.000
Spindle cell proliferation	1	1 (100%)	0 (0%)	0.473
Myelofibrosis	1	1 (100%)	0 (0%)	0.473
Cystic hidradenoma	1	0 (0%)	1 (100%)	1.000
Digital papillary adenoma	1	0 (0%)	1 (100%)	1.000
Fibrokeratoma	1	0 (0%)	1 (100%)	1.000
Seborrheic keratitis	1	0 (0%)	1 (100%)	1.000
Erythema elevatum	1	0 (0%)	1 (100%)	1.000
Botryomycosis	1	0 (0%)	1 (100%)	1.000
Keratinous debris	1	1 (100%)	0 (0%)	0.473

Appendix C: Ethics clearance certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Dr Christain Vyamungu

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M191049

NAME: (Principal Investigator)	Dr Christain Vyamungu
DEPARTMENT:	Plastic Surgery Charlotte Maxeke Johannesburg Academic Hospital
PROJECT TITLE:	Analysis of the histology results of hand masses seen at the Chris Hani Baragwanath Academic Hand Unit
DATE CONSIDERED:	25/10/2019
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Dr Elias Ndobe and Mr Sefeane Tatolos
APPROVED BY:	Dr. C Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	11/11/2019

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

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Principal Investigator Signature

20/11/2019
Date

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Appendix D: Turn tin report

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Appendix E: Approved MMED Protocol

Analysis of histology results of masses of the Hand seen at the Chris Hani Baragwanath academic hospital Hand unit in Johannesburg South Africa.

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CONTENTS

Introduction

Hand masses are some of the entity presenting to a healthcare practitioner working in a Hand unit [1]. Patients present either because of pain and limited hand function caused by the mass or because of aesthetic embarrassment. No study of hand masses in a South African institution is reported in the literature.

The majority of hand masses are benign and are predominantly made of ganglions, giant cell tumours (GCT)and lipomas [1,2]. However they can cause symptoms due to pressure on surrounding tissues like nerves or blood vessels. There are reported Cases of patients presenting with carpal tunnel syndrome or cubital tunnel syndrome due to lipoma compressing the median or ulnar nerve respectively[3]. Patients with carpal tunnel syndrome usually present with a history of numbness and tingling sensation of the hand affecting the thumb, index and middle finger with a decreased grip strength.[4]

It is currently known that ganglion cysts make the most of the hand masses followed by giant cell tumours and others[5]. Malignant hand masses are rare[1,2].

Hand masses can arise from the Soft tissues or from the bones[1,6].

The soft tissue involved can be skin and adnexa, fat, nerves, blood vessels and tendon sheaths[1,6,7]. Cavit et al[1] reviewed 402 cases of hand tumours and found that 89.8% of cases were soft tissue tumours while 10.2% were bone tumours. There was a female preponderance with an average age of 41.9 years. Their most common soft tissue masses were ganglion cyst (34,6%), followed by giant cell tumour of the tendon sheath (22,1%), hemangioma (11,3%), lipoma (5%), and epidermal cyst (5%). The main complaints were mass growth and pain. Only 2.5% of tumours were of malignant nature.

Ganglion cysts occur mostly in the wrist, but any joint can be involved. Most ganglions (60-70%) occur on the extensor surface of the wrist with a pedicle that allows communication with the joint[8]. Ganglion cysts generally occur between the second and fourth decade of life[1,5,9]. The exact etiology of ganglion cysts is still elusive. It is suggested that a ganglion results from the joint capsule herniation or from trauma to the capsule with leads the movement of synovial fluid into the tissue surrounding the joint[9]. However, there is no synovial lining within the within the cyst[5] and some patients in our institution do not present with a history of trauma. The majority of these ganglions are asymptomatic and patients present either for cosmetic reasons or if there is pain. Management ranges from mechanical pressure and rupture, local ganglion aspiration and steroid injection with high recurrence rates, to surgical excision[1,5,9]. The definitive treatment is complete surgical excision of the ganglion mass (cyst, and pedicle) with a piece of the capsule from the joint [8-10]. This treatment has lower recurrence rates.

The second most common hand mass is the tendon sheath giant cell tumor (GCT)[11,12]. Pigmented villonodular synovitis, fibrous xanthoma, are some of the other names[11].GCT is soft

tissue mass that develops over a long period up to years however it is known for its local destructive ability. It is believed that trauma, inflammation, and neoplastic etiology are involved in the development of GCT[12]. These are mostly benign with very few cases of malignant lesions. Malignant GCTTS have a high occur of lymph node metastasis and increased mortality rate. In general, GCT are characterised by an increased recurrence rate (7-29%).[2] Factors considered to be causing recurrence include proximity to distal interphalangeal joint, pressure erosion on radiographs, presence of degenerative joint, and type 2 lesion described by Al Qattan[11,12].

However, it is apparent that recurrence rate results from incomplete excision and that the mainstay of surgical management is meticulous dissection and use of magnification to reduce recurrence. With this protocol Suresh et al managed to decrease recurrence to 1 out of 14 patients[12].

Haemangiomas are neoplastic proliferations of the endothelium presenting during the first few weeks of life. Infantile haemangiomas are the most common tumours of infancy and have a variable depth of involvement. The superficial haemangioma does not involve the subcutaneous level and is nodular and reddish. However, the deep haemangioma has a blue colour or telangiectasia. A hemangioma with deep and superficial parts is known as compound type.[13] They have a period of growth then quiescence for 9-12 months followed by a period of involution and regress over the first seven years of life [1]. It is reported that involution of 50%,70% and 90% of the hemangiomas occurs by 5,7, and 9years with some variability.[10] Management of hemangiomas range from observation, medical management with intralesional or oral steroids, interferon and vincristine to surgical management.[13] Surgical therapy will involve either excision, laser or both.

Lipomas are benign tumours consisting of mature adipocytes. Although commonly found on the trunk, lipomas are uncommon in the hand. They usually grow slowly and often are of large size at presentation. They are painless and are discovered by palpation of a soft regular and movable mass.[4] However they have been reported to cause compression of the median nerve with carpal tunnel or ulnar nerve in the Guyon canal with development of lower ulnar nerve palsy.[3,4] Chatterton et al reported on an exceptionally large lipoma of the left hand which measured 10x8cm which presented with no neurological symptoms. The treatment is usually Surgical excision.[3]

Pyogenic granuloma as a benign vascular tumor of the skin and mucous membranes occurs in children, pregnant women and young adults. Epulis gravidarum is a pyogenic granuloma that involves the mucous membranes of pregnant women. The other names include, granuloma gravidarum or tumour of pregnacy[14]. Changes of hormones in pregnancy or use of oral contraceptives are suspected of being the precursors besides low-grade chronic irritation and trauma.[14] Clinically, pyogenic granuloma presents as friable exophytic nodule of reddish to yellow tint that easily ulcerates or bleeds[15]. Histologically, pyogenic granuloma is classified into Lobular capillary hemangioma and non-lobular capillary hemangioma[15]. The natural course of pyogenic granuloma can be classified into three distinct phases namely the cellular, the capillary/vascular and the involutional phases[15].Treatment includes silver nitrate. Rader et al, achieved 85% cure rate of pyogenic granuloma with silver nitrate but the definitive treatment is surgical excision[14].

Other less common soft tissue masses of the hand include glomus tumour, schwannoma, neurofibromas, epidermal cysts, palmar fibrosis, and fibroma.

The glomus tumours are painful benign tumours from the modified smooth muscles of the glomus body with a slow growth[16]. The glomus body is involved in thermoregulation through

its specialised arteriovenous anastomosis. The glomus tumours can present anywhere on the skin or soft tissues but most commonly the fingers are the site of origin. The usual clinical presentation, is a solitary nodule in the nail bed that is painful on touching or exposure to coldness in the fingertip. Investigations include ultrasound or magnetic resonance imaging[16,17]. Histologically benign glomus tumours are composed of blood conduits that are surrounded by round cell proliferation in a fibrous stroma. Treatment is by meticulous surgical excision with partial removal of the nail to avoid recurrence[17].

Schwannomas are non-malignant proliferation of Schwann cells that occur as soft tissue growths along a peripheral nerve course [7].

With regards to neurofibromas, any peripheral nerve can be involved and MRI is useful for delineating deep lesions[7]. Due to the fact that these lesions are highly intertwined with the fascicles of the nerve, the surgical excision will result in damage to the nerve and a nerve graft may be required for important nerve structures[7].

Bone masses

The majority of bone masses of the hand is represented by enchondromas which are benign masses from the cartilage[1,18]. Cavit et al[1] found 63,4% of all bone tumours to be enchondromas. Enchondromas are usually solitary but can present as multiple lesions in Ollier's disease and Maffucci syndrome. Most patients present with swelling, pain or pathological fracture of the digit involved[19]. Simple X-ray investigation will reveal the diagnosis. Treatment consists in curettage and a variety of ways of dealing with the resultant cavity[19]. Options usually include leaving the cavity to heal by secondary intention or using bone grafts to fill the cavity. However, chondrosarcoma is the commonest malignant bone tumor occurring the hand and can result from malignant transformation of enchondromas in patients with Maffucci syndrome[2,19.]

Very few cases of malignant bone lesions of the hand are mentioned in the literature.

Therefore, the aim of this study is to review the hand cases done at the Chris Hani Baragwanath Hand Unit and compare with the current literature and determine if there is a difference in the type of masses we see.

Objectives

To review and classify the types hand masses according:

- to age
- to gender
- to side of the hand: left or right sides, extensor or flexor aspects,
- and compare the findings with what is known in the current literature.

Study design and methods

This is a retrospective study and will look at the histology results of patients operated for masses of the hand at The Chris Hani Baragwanath academic Hospital Hand unit.

All patients operated from 1/04/2016 to 30/04/2019 with proven histology results will be included in this study. The Chris Hani Baragwanath hand unit theatre register will be used to get the patients records and all information collected will be kept confidential, no patient identifying information will be published. The Hand is defined as the part of the upper limb from the wrist down and the dorsum as the extensor surface and the volar area as the flexor surface. Patients with no histology test results will be excluded from this study.

Sample calculation

The size of the sample will be all the patients operated for hand masses with proven results for the period covered in this study. It is estimated to be more than 50 cases.

Demographics

The nature of the mass, age, gender, surface and side the hand involved will be looked at and compare these to the current literature. The surface will be either volar (palmar or flexor) or dorsal (extensor). The side will be either right or left.

Statistical analysis

All data will be expressed as mean ± SD and percentages for the categorical data. A p value less than 0.05 will be considered significant.

Ethics

Permission to conduct this study has been granted from the Chris Hani Baragwanath Hospital Ethics committee and an application will be submitted to the Wits Human Research Ethics Committee.

Funding

Estimated cost of this study is about R5000 and will be paid for by the investigator,

Dr Vyamungu. The cost will be mainly for transport, printing and data for internet connection.

Problems.

This is a retrospective study and some results may not be found due to incorrect names on the theatre register or patients with masses not entered in the register. Moreover, some patients with small masses especially ganglions may not have histology tests done as the operating surgeon knows clinically the nature of ganglions.

Study timeline

2019-2020	Sept 2019	Oct 2019	Nov 2019	Dec 2019	Jan 2019	Feb 2019	March 2020	April 2020
Protocol/Ethics								
Data collection								
Data analysis								
Thesis writing								
Thesis submission								

Appendix

Data Collection sheet

Code number	Female	Male	Right	Left	Dorsal	Flexor	Histology

Table for each mass type diagnosis

Diagnosis	Age	Gender	Right	Left	Volar	Dorsal

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Journal articles: Lyon DT, Manita AG. Large bowel haemangiomas. Dis Colon Rectum 1984; 27: 404-14.

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