

FLEXOR TENDON INJURIES OF THE HAND: CHRIS HANI
BARAGWANTH ACADEMIC HOSPITAL PATIENT
DEMOGRAPHICS

DEGREE OF MASTER OF MEDICINE IN ORTHOPAEDIC
SURGERY

DEPARTMENT OF ORTHOPAEDICS
FACULTY OF HEALTH SCIENCES
UNIVERSITY OF WITWATERSRAND

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DECLARATION

I, Shaaheen Bismilla, declare that this research report is my own work. It is being submitted for the degree of Master of Medicine in Orthopaedic 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.

.....

.....day of2017

ABSTRACT

The hand is an intricate and important body appendage which plays a vital role in our activities of daily living. Flexor tendon injuries to the hand make up a large amount of patients seen at hospitals all over the world. Hand injuries are quite common and contribute to approximately 28% of injuries to the human body.

A prospective study was conducted, with patients who had sustained flexor tendon hand injuries. The patients who presented to Chris Hani Baragwanath Academic Hospital from 02 March 2015 to 29 July 2015 were included in the study.

The aim of this study was to document and identify the causes (mechanism of injury) and demographic details of patients presenting with flexor tendon injuries at Chris Hani Baragwanath Academic Hospital hands unit.

There were 96 patients in the study, with 80 being right hand dominant and 16 being left hand dominant. Zones II and zones III were the most common flexor zones affected (27 each). There was also a significant amount of zone V injuries (23). Zone IV was the least common zone affected (5).

The results also showed that the most common injury to flexor tendons of the hands occurred in young adult males, the majority of whom were unemployed. This disproves our hypothesis, as it was hypothesised that most injuries would occur in the work place.

This study was undertaken in an attempt to reduce the incidence and frequency of hand injuries in our community, by assessing the common causes and patient particulars of flexor tendon injuries. This information can now be used to teach awareness which now can be used in the work place.

ACKNOWLEDGEMENTS:

Dr C Sathekga – Supervisor

Dr T Sefeane – Co- supervisor

Dr B Milner – Analysis, layout, general

Mr Poopedi – Layout

Prof. F Bischof - Analysis

GLOSSARY OF TERMS

Tendon	Band of fibrous tissue that connects muscle to bone
Zone I	From the tip of the finger to the flexor digitorum superficialis insertion
Zone II	From flexor digitorum superficialis insertion to the distal palmar crease
Zone III	From the distal palmar crease to the carpal tunnel
Zone IV	Situated within the carpal tunnel
Zone V	From the wrist to the forearm
Zone VI	Forearm muscle bellies
Metacarpophalangeal joint	Joint between the carpal bones and the phalanges of the fingers
Distal	Point away from the centre of the body

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INTRODUCTION

LITERATURE REVIEW

The hand is a very delicate and extremely important organ which plays a pivotal role in our activities of daily living. Flexor tendon injuries to the hand contribute to a significant amount of patients seen at hospitals worldwide. Hand injuries are among the most common injuries that occur to the human body, they comprise of approximately 28% of injuries to the musculoskeletal system¹.

It has been shown that hand injuries mostly occur in professional young adult males, affecting their dominant hand^{1,2,3}. Traumatic hand injuries are also seen daily at primary health care facilities, so it is important that these injuries are treated correctly as it may influence the patients' function and quality of life in the future⁴. This therefore also affects their ability to resume work in an effective and productive way.

Due to the frequency of poly trauma patients in our setting (Chris Hani Baragwanath Academic Hospital), hand injuries can often be missed or neglected, which ultimately results in the detriment of the patient. Furthermore, due to the nature of flexor tendon injuries to the hand, they result in a large economic and social loss due to the lost time away from employment, work and medical expenses. This includes both physical and psychological consequences⁵.

Hand injuries can occur during employment, during road accidents and at home while busy with recreational activities. Devastating hand injuries are often due to machinery accidents and gunshot wounds². Injuries to the hand can also be attributed to the conclusion that the standard safety regulations in the work place have not been adhered to, therefore to some degree it would be possible to decrease the incidence of these injuries.

With regards to the anatomical location of the hand injury, the thumb was most common, followed by the index finger⁷. With the anatomical flexor tendon zones of the hand, Zone III, followed by zone II and then zone I flexor tendon injuries were found to be the most common^{2, 7}.

It has also been shown that traumatic tendon injuries to the hand occurred in males aged 20-29, which correlates with those people who have labour intensive occupations. This group of patients are therefore at a risk for hand tendon injuries⁸.

Circular saws have recently been recording higher sales volumes, and due to their cheaper prices and more "Do it yourself" products, there has been an increase in the amount of reported hand injuries due to circular saws and other power tools⁶. Most injuries caused by a saw occurred at the level just distal to the metacarpophalangeal joint, with many of these injuries causing fractures at this level⁹. This therefore makes the management of these injuries more complicated.

Surgical intervention requires evidence –based proof for management and treatment, it is therefore important to establish the causes and demographics of flexor tendon injuries, in order to reduce the incidence of these injuries in our setting.

This study is aimed at reducing the incidence and severity of hand injuries in our society, by identifying the common causes and demographics of flexor tendon injuries. By using the data obtained, an awareness and education can be instilled in the work environment or wherever applicable.

HYPOTHESIS

The most common cause of flexor tendon injuries presenting at Chris Hani Baragwanath Academic Hospital hands unit is injury at work (formal or informal), in adult males.

AIM

To document and identify the causes (mechanism of injury) and demographic details of patients presenting with flexor tendon injuries at Chris Hani Baragwanath Academic Hospital hands unit.

STUDY OBJECTIVES

There are currently very few studies relating to the causes and demographics of flexor tendon injuries worldwide and in our setting. In our society, a developing country, the impact of hand injuries is significant as it affects young working people, who contribute significantly to our economy. Therefore, the aim of this study is to establish the common causes and demographics of flexor tendon injuries at Chris Hani Baragwanath Academic Hospital, and possibly try to minimize the incidence of these injuries.

To determine the common causes and demographics of flexor tendon injuries by assessing the

- Causes (mechanism of injury)
- Zones of the hand
- Gender
- Occupation
- Age
- Hand dominance/handedness

MATERIALS AND METHODS

STUDY DESIGN

A prospective study was conducted, with patients who had sustained flexor tendon hand injuries. The patients who presented to Chris Hani Baragwanath Academic Hospital from 02 March to 29 July 2015 were included in the study.

The setting of the study was Chris Hani Baragwanath Academic Hospital – hands unit, Department of Orthopaedic Surgery. Patients who had been admitted to the Hand Unit, requiring surgery to their flexor tendons were part of the study.

Patients with flexor tendon hand injuries and those who had given consent to participate in the study were included. Patients who also sustained a fracture to the affected hand or finger were also included.

Patients who did not consent and patients under the age of 18 were excluded from the study.

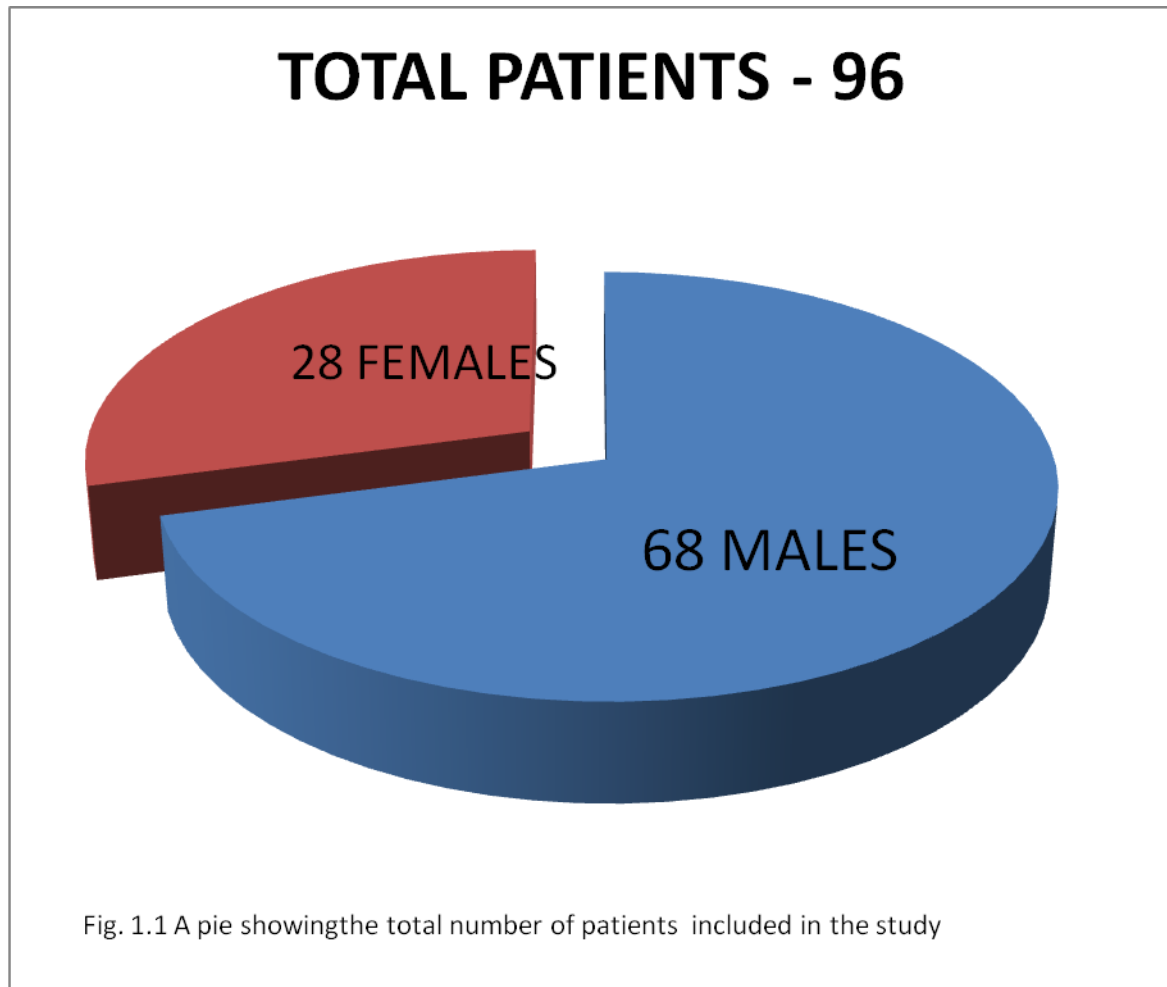
METHODS

An anonymous data collection sheet was available at the Chris Hani Baragwanath Academic Hospital hands unit. The data collection sheet used in this study is shown in Appendix A. These forms were then filled in at the department after the patient was taken to theatre. The forms were filled in by the doctors in the hand unit after the patients were operated on.

Guidance and orientation with regards to hand examination and anatomy was explained to the relevant doctors completing the questionnaire. A picture of the hand depicting the flexor tendon zones (I-V) was used to identify the location of the injury (Appendix B). Informed consent was also obtained from the patients. The data was then analysed with the assistance of a biostatistician and we commenced interpreting our findings. Data was captured using Microsoft Excel 2010 in order to demonstrate results. The data collected was reported as percentages using bar graphs.

RESULTS

There were a total of 96 patients who were included in the study. From this total, 68 (70,8%) were males and 28 (29.2%) were females, as shown in figure 1.1



AGE

The ages of the patients varied from 18 to 61 years, with the youngest patient being 18 and the oldest patient being 61. The average age of patients in this study was 31.84 years. The average for male participants was 30.42 whereas the average for females was 35.2, as depicted I figure 1.2 below.

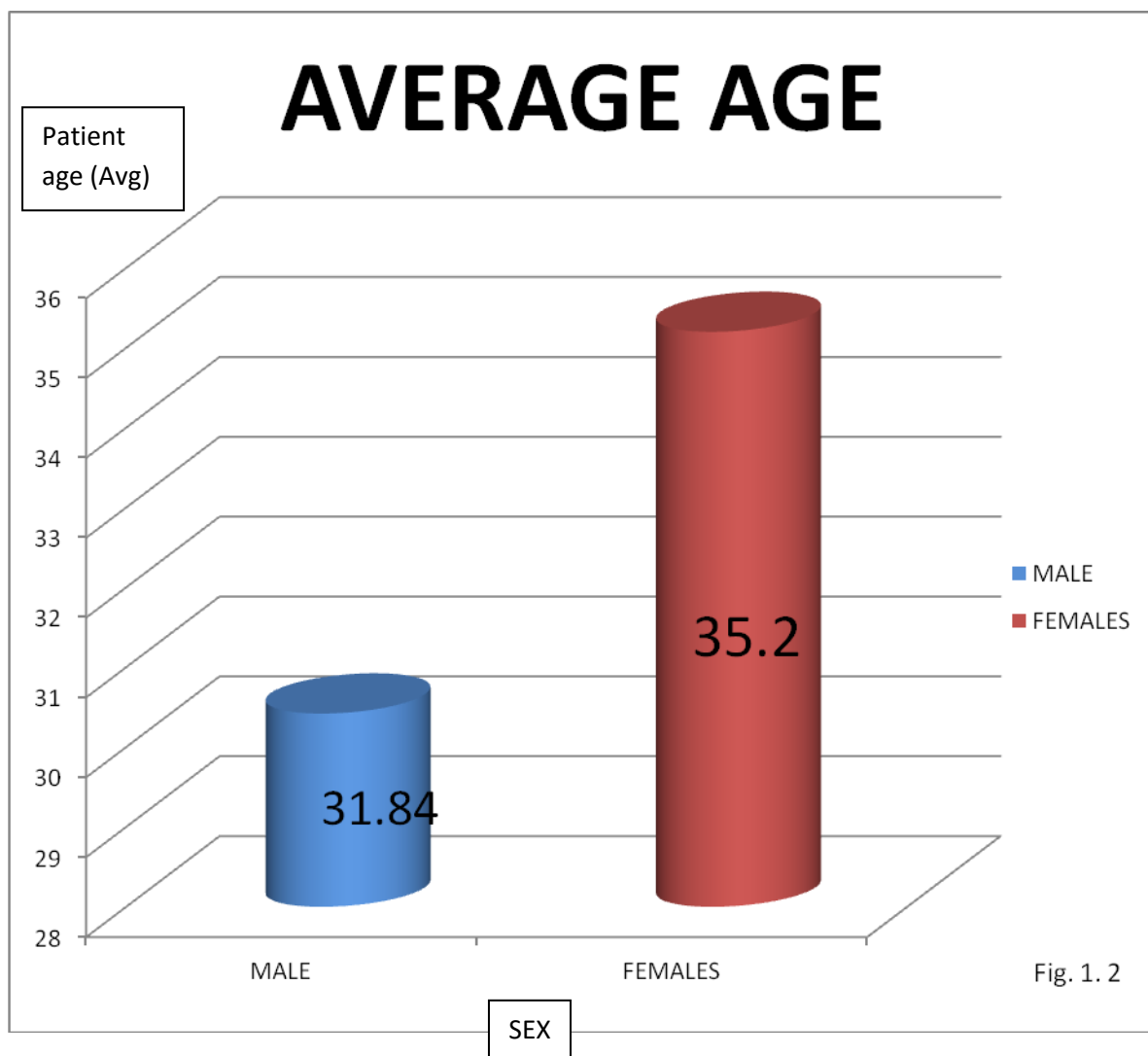


Fig. 1.2 A bar graph showing the average age of patients and their sex.

HAND DOMINANCE

There were a total of 80 patients (83.3%) who were right hand dominant and 16 (16.7%) who were left hand dominant. From the males, 57 (59.37%) patients were right hand dominant and 11(11.46%) were left hand dominant. From the females, 23 (23.96%) patients were right hand dominant and 5 (5.21%) were left handed.

From the total number of 68 male patients, 54 patients had injuries which affected their dominant hand, which gives an average of 79.4%. Similarly, out of the 28 female patients, 21 (75%) had injuries to their dominant hand. The total percentage of dominant hand injuries was 78.2%. This value correlates with previous studies where in most case the dominant hands were affected^{1, 2}. These findings are illustrated below in figure 1.3.

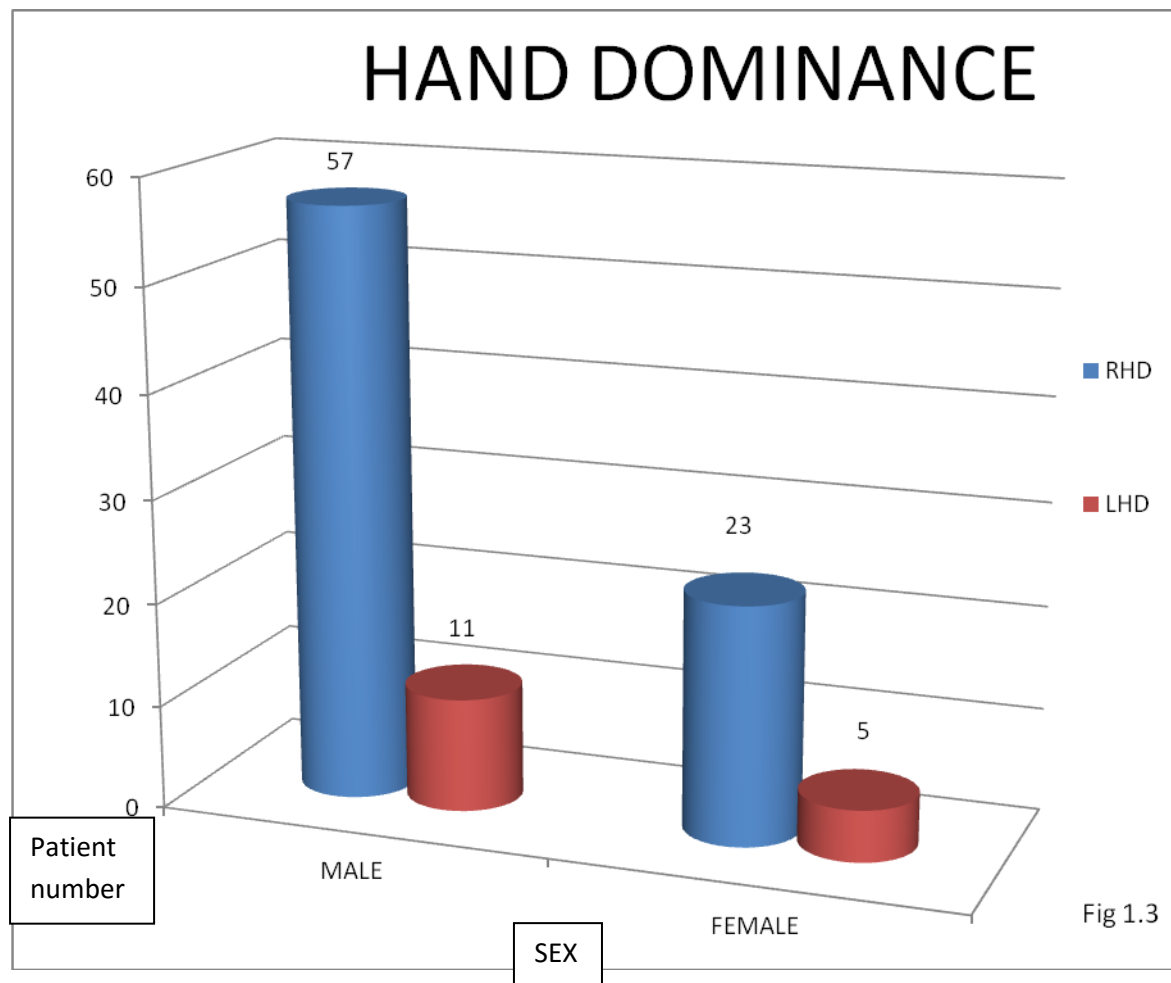


Fig 1.3 A bar graph showing the number of males/females and their hand dominance and the

ZONES OF THE HAND

The flexor tendons of the hand are divided into 6 zones, classifying them into the area of anatomy which was injured.

FLEXOR TENDON ZONES OF THE HAND AFFECTED – TOTAL

From the total 96 patients in this study, zones II and zones III were the most common flexor zones affected (27 each), whereas the least common was zone IV with 5 injuries. Furthermore there were 23 injuries which occurred in zone V. (See figure 1.4 below).

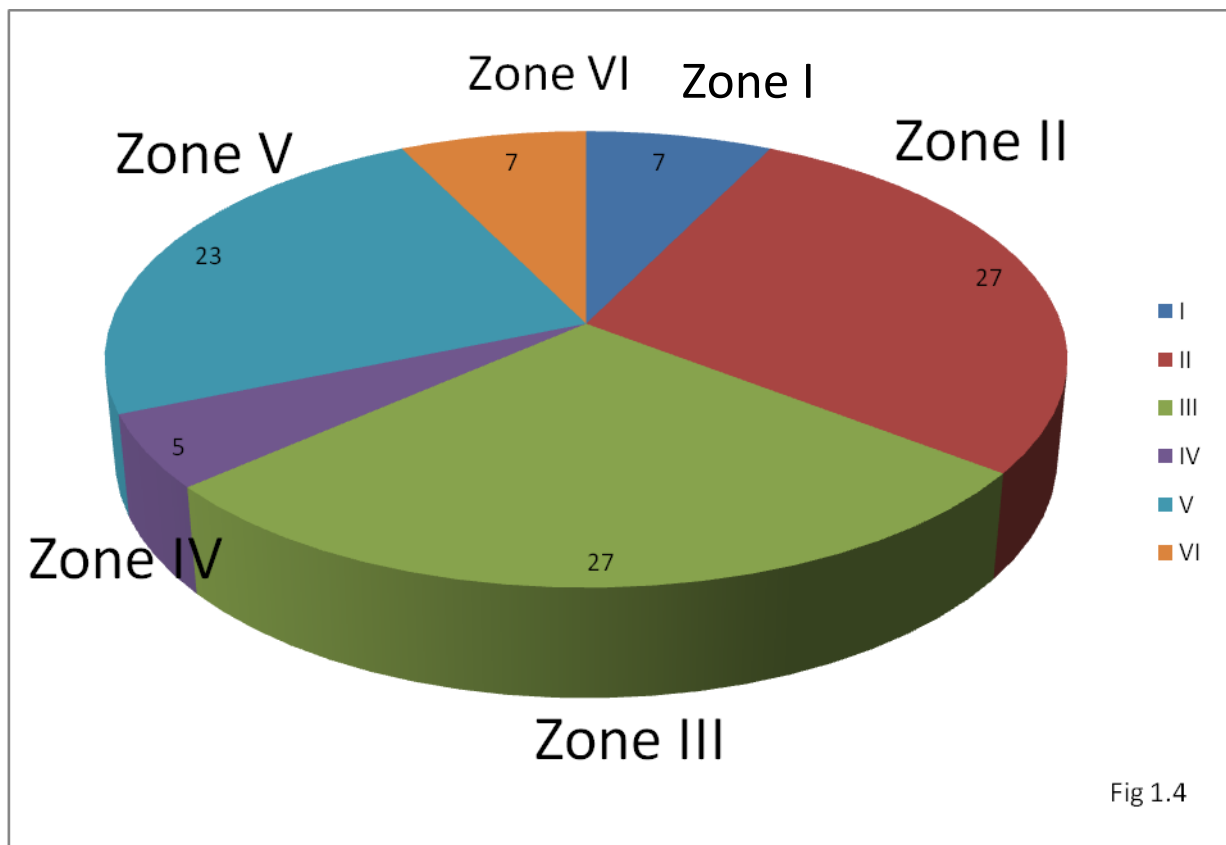


Fig 1.4 A pie graph showing the number of patients, with their respective flexor tendon zone injuries

FLEXOR ZONES OF THE HAND - MALES

Assessing the flexor tendon zones affected in the male group of the study, zone V was the most common injured area with 22 patients. Zone IV was the least common injured zone, with only 2 patients as shown in figure 1.5 below.

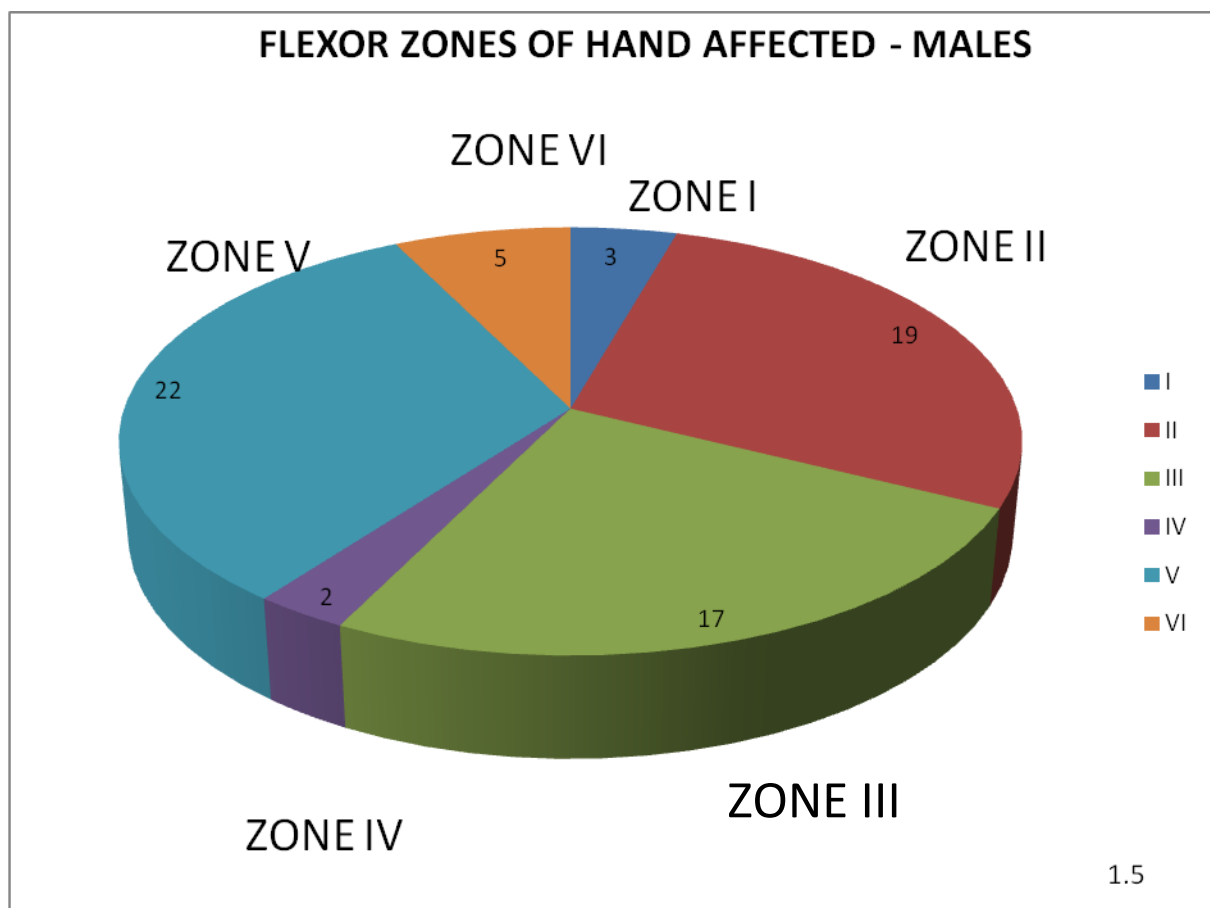


Fig 1.5 A pie graph showing the number of male patients with their respective flexor tendon zone injuries

FLEXOR ZONES OF THE HAND - FEMALES

Assessing the flexor tendon zones affected in the female group of the study, zone III was the most common injured area with 10 patients. Zone IV, V and VI were the least common injured zones, with only 2 patients each, as shown in figure 1.6 below.

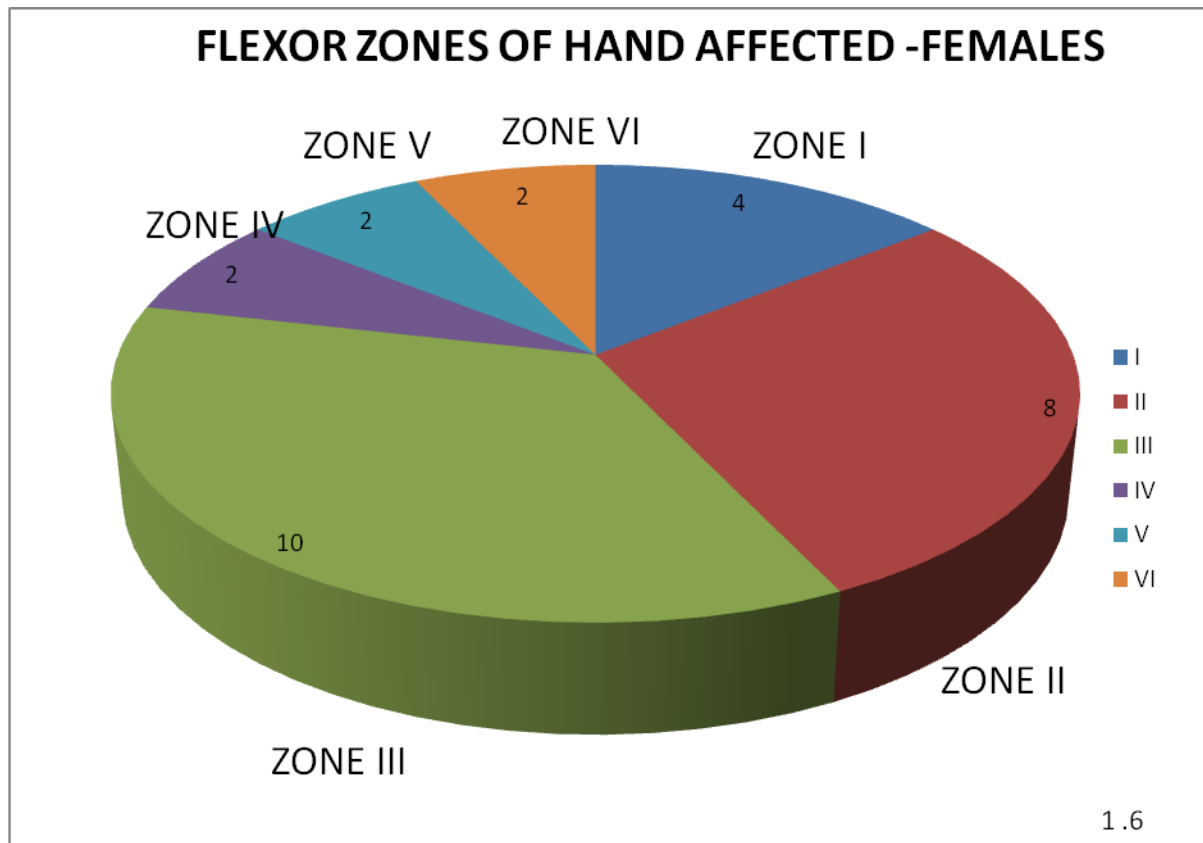


Fig 1.6 A pie graph showing the number of female patients with their respective flexor tendon zone injuries

CAUSES OF INJURY

Analysing both the male and female participants, there was a wide variety of causes of injury to the hand (See figure 1.7).

However, the most common injury was assault with a knife, which consisted of 41 patients. This was significantly higher than the second cause which was patients who were cut by a glass bottle (20 patients). Seven patients, all male, sustained injuries with a grinder (saw). These injuries were either sustained at home or at the work place.

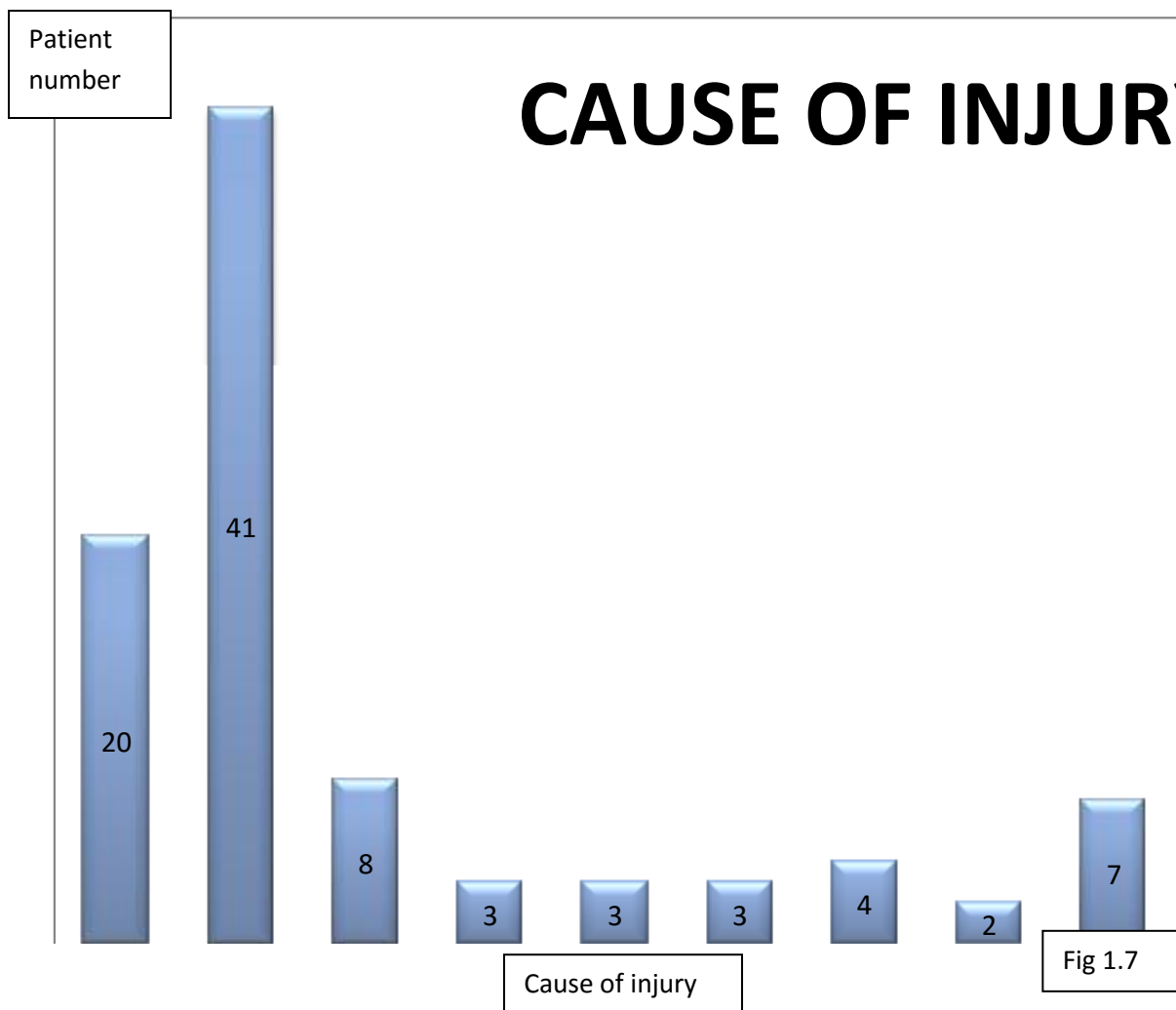


Fig 1.7 A bar graph showing the number of patients and their causes of injury

OCCUPATION

Analysing both the male and female participants, there was a wide variety of occupation. However, a large number of patients from the study were unemployed (26 patients). Teachers and students were the next common type of occupation, with 13 and 12 patients respectively. (See figure 1.8)

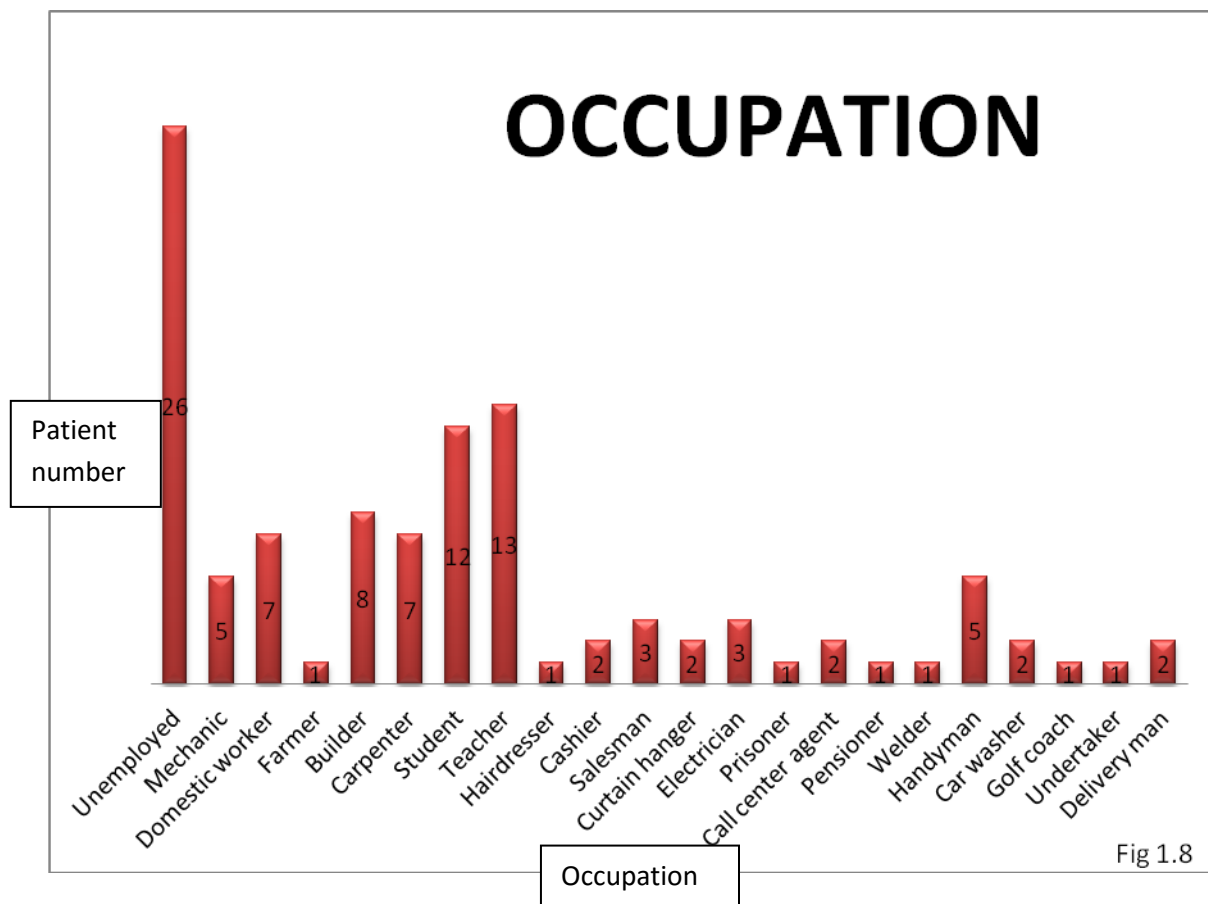


Fig 1.8 A bar graph showing the number of patients and their occupation

DISCUSSION

The human hand is a vital and unique extremity which plays an important part in our everyday lives. Flexor tendon injuries of the hand add to a sizeable amount of patients seen at hospitals for either admission or consultations. Hand injuries are one of the most frequent injuries that occur to patients and they make up about 28% of injuries to the musculoskeletal system¹.

Ninety six patients were included in the study. From this total, 68 (70,8%) were males and 28 (29.2%) were females.

The ages of the patients varied from 18 to 61 years, with the youngest patient being 18 and the oldest patient being 61. The total average age of the entire study was 31.84 years. The average age for male participants was 30.42 and females were 35.2 years of age.

It can be deduced from these results that young men are most commonly affected in terms of flexor tendon injuries to the hands. Although many of them were unemployed, they are in the age group (30.42 years) which represents the dominating work force of our community.

Many of the patients were also the bread winners of the families. These injuries take time to heal and require a good rehabilitation programme, which ultimately prevents or delays their return to work.

Among the females, who were a minority in this study, they also fall into the age group (35.2 years) where they are independent and often provide financial support to their families.

The results from this study correlates with findings from other studies, in which most flexor tendon injuries occur in young adult males, affecting their dominant hand^{1,2,3}. However in previous studies, injuries were more common in the work place, among professionals², whereas in this study, most of the patients were unemployed.

Due to the nature of flexor tendon injuries to the hand, they result in a large economic and social loss due to the lost time away from employment, work and medical expenses. This includes both physical and psychological consequences⁵.

With regard to the anatomical location of the injuries, the flexor tendon zones II and III were most commonly injured. This result is similar to the study by Ihekire et al in 2010, which showed that zone III, followed by zone II were the most commonly affected zones².

Traumatic hand injuries are also seen daily at primary health care facilities. Therefore it is important that these injuries are treated correctly as it may influence the patients' function and quality of life in the future⁴.

Hand injuries can occur during employment, during road accidents and at home while busy with recreational activities. Devastating hand injuries are often due to machinery accidents and gunshot wounds². However, in this study the causes of hand injuries varied. The most common cause of injury was assault/stabbed by a knife, followed by being cut by a glass bottle. This indicates that

violence was the leading cause of injury in our patients. Only three of the patients in this study had sustained an injury due to a road accident.

Circular saws have recently been recording higher sales volumes, and due to their cheaper prices and more “Do it yourself” products, there has been an increase in the number of reported hand injuries due to circular saws and other power tools⁶. In this study, 7 patients, all males were cut with a circular saw while busy working.

Many occupations such as builders, mechanics and carpenters are male dominated. In this study this also coincides as quite a few patients: 8, 5 and 7 respectively sustained flexor tendon hand injuries.

The majority of patients injured were due to an assault of some kind. This correlates with the high violence and crime related events in our society.

It is important that initial therapy is consistent and efficient in order to obtain a good outcome. It is essential that there is a close relationship and follow up plan between the surgeon and the patient as post-operative rehabilitation is extremely important¹¹. There is also a need for large scale randomised control trials to monitor clinical outcomes for different suture choices and repair techniques¹².

The results from this study supports the proposed hypothesis to be partially correct as it was hypothesized that the most common injury to flexor tendons of the hands occurred in young adult males, but in the work place. Most of our patients were males, but they were unemployed.

This study was initiated to decrease the frequency of hand injuries in our region, by attempting to extract the usual causes of flexor tendon injuries of the hand. With the information gathered, we can create an awareness and learning campaign by providing information especially in the working environment or wherever necessary. I intend to make a few posters and display them in various hospital areas (casualties/cafeeteria etc.). I also plan to distribute a few posters to the local factories and also to the local shebeen owners, thereby spreading the awareness.

CONCLUSION

Hand injuries comprise of a large number of cases which present to our emergency department on a daily basis. In a developing country like ours, most patients who were affected were young adult males. Although most patients were unemployed, this age group and demographics of patients have the most potential to work and contribute to our economy. Unfortunately, most patients also injured their dominant hands, which ultimately makes it more difficult to start, or return to employment.

Even patients, who are unemployed, are still physically active and their daily activities of living are negatively affected. Their poor economic status also makes it very difficult to follow up for their occupational therapy rehabilitation. In most instances they require a weekly follow up.

A few patients who were injured at work, and who were actually employed had severe injuries sustained by a circular saw. These patients had injuries which had affected more than one finger and even traumatic amputation. Thus, their rehabilitation time was longer and intensive.

More education, information and awareness should be encouraged in both the work place and the general public informing patients on the potential negative impact flexor tendon injuries to the hand can have on the economy.

Due to the majority of injuries inflicted from an assault of some kind, the violent nature of these injuries in our community should be highlighted to the authorities to make them aware of the impact of these injuries as well.

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Appendix A

Example of a data collection sheet used to collect information

DATA COLLECTION SHEET

GENDER:

☐ M☐ F

AGE:

HAND DOMINANCE:

☐ R☐ L

OCCUPATION:

CAUSE OF INJURY:

ZONE OF INJURY:

FINDINGS AT THEATRE:

APPENDIX B

This diagram was used a guide as to where the injury had occurred on the patient.



Fig 1.9 (10) A diagram of the hand depicting the 5 flexor tendon zones

APPENDIX C



GAUTENG PROVINCE

HEALTH
REPUBLIC OF SOUTH AFRICA

MEDICAL ADVISORY COMMITTEE

CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

PERMISSION TO CONDUCT RESEARCH

Date: 22nd December 2014

TITLE OF PROJECT:

Flexor Tendon Injuries of the Hand: Chris Hani Baragwanath Academic Hospital Patient Demographics

UNIVERSITY: Witwatersrand

Principal Investigator: Dr S. Bismilla

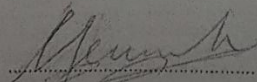
Department: Orthopaedics

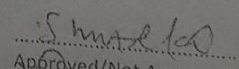
Supervisor : Dr C Sathekga / Dr T Sefeane

Permission Head Department (where research conducted): Yes

The Medical Advisory Committee recommends that the said research be conducted at Chris Hani Baragwanath Academic Hospital. The CEO / management of Chris Hani Baragwanath Academic Hospital is accordingly informed and the study is subject to:-

- Permission having been granted by the Committee for Research on Human Subjects of the University of the Witwatersrand.
- The Hospital will not incur extra costs as a result of the research being conducted on its patients within the hospital
- The MAC will be informed of any serious adverse events as soon as they occur
- Permission is granted for the duration of the Ethics Committee Approval.


Recommended
(On behalf of the MAC)
Date: 22/12/2014


Approved/Not Approved
Hospital Management
Date: 23/12/14

Human Research Ethics Committee (Medical)

Research Office Secretariat: Senate House Room SH 10005, 10th floor. Tel +27 (0)11-717-1252
Medical School Secretariat: Medical School Room 10M07, 10th Floor. Tel +27 (0)11-717-2700
Private Bag 3, Wits 2050, www.wits.ac.za. Fax +27 (0)11-717-1265



12 December 2014

To Whom It May Concern

SUBJECT: CONFIRMATION OF STUDY APPROVAL

Protocol Ref No: M141117

Protocol Title: Flexor Tendon Injuries of the Hand: Chris Hani Baragwanath
Academic Hospital Patient Demographics

Principal Investigator: Dr Shaaheen Bismilla

Department: Orthopaedics

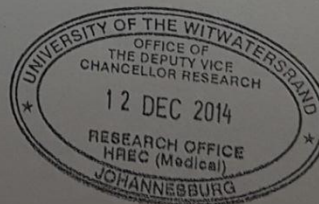
This letter serves to confirm that the Human Research Ethics Committee (Medical) has approved the above mentioned study. In order for a clearance certificate to be issued, the researcher is required to submit written approval to conduct the study in your district/institution.

Should you have any queries, you may contact me at tel 011 717 1234/2656 or by email langutani.masingi@wits.ac.za.

Yours Faithfully,

A handwritten signature in black ink, appearing to read "Langutani Masingi".

.....
Mr Langutani Masingi
Administrative Officer
Human Research Ethics Committee (Medical)





R14/49 Dr Shaaheen Bismilla

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M150134

NAME: Dr Shaaheen Bismilla
(Principal Investigator)

DEPARTMENT: Orthopedics
Chris Hani Baragwanath Academic Hospital

PROJECT TITLE: Flexor Tendon Injuries of the Hand: Chris Hani Baragwanath
Academic Hospital Patient Demographics

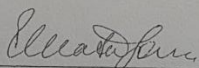
DATE CONSIDERED: 30/01/2015

DECISION: Approved unconditionally

CONDITIONS:

SUPERVISOR: Dr Cynthia Sathekha

APPROVED BY:


Professor P Cleaton-Jones, Chairperson, HREC (Medical)

DATE OF APPROVAL: 25/02/2015

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

DECLARATION OF INVESTIGATORS

To be completed in duplicate and ONE COPY returned to the Secretary in Room 10004, 10th floor, Senate House, University.
I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**

Principal Investigator Signature _____

Date _____

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

