

**AN ANALYSIS OF DESTRUCTIVE SURGERIES OF THE EYE AT JIMMA
UNIVERSITY MEDICAL CENTER, JIMMA, OROMIA, ETHIOPIA.**



BY GUDINA MILKESSA (MD, 4th YEAR OPHTHALMOLOGY RESIDENT)

**A RESEARCH THESIS TO BE SUBMITTED TO INSTITUTE OF HEALTH
SCIENCES OF JIMMA UNIVERSITY IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE SPECIALITY CERTIFICATE IN OPHTHALMOLOGY.**

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ABSTRACT

Background: - Destructive eye surgeries (DES) is a management option offered patients when further retention of the globe is likely to affect ocular or general health. DES includes exenteration, enucleation, and evisceration. The decision to perform DES is usually distressing to all concerned; the patients, their relatives, and the Ophthalmologist; and is taken as a last resort.

Objective: - The aim of this study is to assess the patient demographics, frequency, and indications for destructive eye surgeries at Ophthalmology department of Jimma University Medical Center with the aim of identifying the preventable causes for which appropriate preventive measures could be recommended.

Method: - A retrospective descriptive study of all patients who underwent evisceration, enucleation or exenteration at Ophthalmology Department, JUMC from May 2017 to August 2022 G.C was conducted. Data was retrieved from minor and major Operation room records and patient card were reviewed. Information collected includes age, sex, occupation, eye affected, indications for surgery and type of destructive surgery. Data was entered into Epidata and analyzed by SPSS 26. The groups were compared using the Chi-square test for categorical variables. One way ANOVA also used.

Result: - A total of 184 eyes of 183 patients, who had undergone destructive eye surgery, were reviewed. The mean age of the patient was 40.04 ± 23.49 years, median 40 years, with a range of 2 months to 85 years. Male to Female ratio was 1.4:1. Evisceration was the most common surgery performed in 153 cases (83.15%), followed by enucleation in 16 cases (8.7%) and exenteration in 15 cases (8.15%). The most common indication in our study was ocular infection (33.15%), staphyloma (21.19%), neoplasia (16.30%) and open globe injury (10.33%). SCC was the most common indication for exenteration while RB for enucleation. Eye implant and prosthesis placement was performed for 16.57% and 5.97% eyes respectively.

Conclusion: - Ocular infection, staphyloma and tumor were the most common indications for destructive eye surgery in our center. Most of the ocular conditions leading to DES were preventable. Hence proper care, public awareness, and protective measures for maintaining ocular health can reduce the burden of such destructive surgeries.

Key words: - Destructive eye surgeries, Evisceration, Enucleation, Exenteration, Endophthalmitis.

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ACRONYMS

AAO: American Academy of Ophthalmology

BCVA: Best corrected visual acuity

JUDO: Jimma University Department of Ophthalmology

JUMC: Jimma University Medical Center

OPD: Out Patient Department

DES: Destructive eye surgery

CBE: Community based education

SO: Sympathetic Ophthalmia

RB: Retinoblastoma

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CHAPTER ONE

INTRODUCTION

1.1 Background

Patients can present with conditions that lead to the eye removal or the orbital contents in order to safeguard life, to preserve vision in the fellow eye, or to enhance comfort and cosmesis. The indications for anophthalmic surgery are diverse, and the procedure of choice varies. Enucleation involves removal of the entire globe while preserving remaining orbital tissues. Evisceration is the removal of the intraocular contents (lens, uvea, retina, and vitreous), leaving the sclera, extraocular muscles, and optic nerve intact. Exenteration refers to the removal of some or all of the orbital tissues, including the globe. The cosmetic goals in anophthalmic surgery are minimizing any condition that draws attention to the anophthalmia. Surgical efforts to produce orbital and eyelid symmetry and to promote good prosthetic position and motility enhance cosmesis [1, 2].

Destructive eye surgery (DES) is a surgical intervention offered when further retention of the globe is likely to affect ocular health, general health or jeopardize the patient's survival. The decision for this surgery is a difficult one for both the patient and the physician, hence these procedures are recommended only as a last resort. Besides the clinical indication, the physician has to consider the visual potential of the eye, the potentials for complications and the patient's psychological sequelae that ensues [3].

The surgical removal of the intraocular contents of the eye is called "evisceration". The conjunctiva, sclera and orbital contents are not removed in Evisceration. Indications for evisceration include intractable ocular infections, intractable terminal Glaucoma, phthisis bulbi, an unsightly blind eye, and the need for prophylaxis against sympathetic ophthalmia(SO) following a ruptured globe [4]. Evisceration of the ruptured globe before the onset of SO is of utmost importance. Thereafter, it has no beneficial effect. A blind eye with intractable infection (endophthalmitis or panophthalmitis) is a very important indication for evisceration. The procedure is least likely to enhance the spread of infection from the eye to the cerebrospinal fluid [2, 5].

Evisceration was found to be a safe and quicker alternative procedure to enucleation. The benefits of evisceration are better cosmesis and functionality with less exposure to anesthesia, but the risk of SO and the possible dissemination of an intraocular tumor after evisceration must be weighed against the functional and cosmetic benefits of that procedure over enucleation. In addition, evisceration is the same to enucleation in terms of pain relief, infection treatment, and improved appearance. The absolute contraindication to evisceration surgery is suspected or confirmed intraocular tumor [4, 6].

Enucleation is the removal of eyeball from the orbit with severing of the optic nerve sheath. it is a cure for patients with intraocular malignancy, a vision-sparing procedure for patients at risk of sympathetic ophthalmia, a relief for patients with a blind, painful eye and a method to improve cosmesis.[3] Enucleation is usually the procedure of choice in primary intraocular malignancies with failed conservative management and ocular conditions in which the nature of intraocular pathology is unknown [6].

Orbital exenteration is a disfiguring type of DES that involves removal of orbital contents including the globe. It is an infrequently performed procedure which is usually reserved for orbital malignancies or life-threatening orbital infections. Exenteration may involve total or partial removal of orbital contents and may spare the eyelids or portion of orbital soft tissues. Removal of bone and soft tissues may be necessary to clear surgical margins [1, 7].

DES is a disfiguring procedure that has devastating functional and psychological effects on the life of an individual. It causes degraded self-image and depression especially in cases of losing eyes due to trauma or unexpected malignancy. Anophthalmos and the artificial eye use also have emotional and economic impacts. The decision to remove an eye is often difficult for both surgeon and patient because of the enormous psychological sequelae. The holistic care including these components in the management by the eye care providers is advocated. Family involvement and psychological support throughout the preoperative and postoperative process and an explanation of the possibility of prosthetic adaptation are important [1, 8-10].

1.2 Statement of the problem

Indications for DES vary and could reflect the pattern of severe or end stage eye morbidities in a given environment. It gives an insight into the causes of uniocular blindness in a community. Knowing the frequency of causes of end stage ocular morbidities leading to surgical removal of the eye can help identify patients who need early interventions by other than DES. The indication for these surgeries varies from place to place and is especially different between developing and developed countries.

Destructive eye surgeries were last audited in Ethiopia 27 years ago at `Tor-hayloch Hospital`. The result shows that, the most common causes of removal of the eye were: traumatic globe rupture (33%), malignancy (21%), ugly corneal staphyloma (11%) and panophthalmitis without external cause (11%) [11]. This cannot be generalized for the community as the study center is a military hospital, and most traumatic cases in military areas were caused by high energy explosions. Second, male predominance may be affected not only from trauma, but also the natural dominance of males in military areas.

It can be psychologically devastating to lose an eye and no study to the best of Investigator`s knowledge has assessed the rate of acceptance of these procedures in our country, as many patients refuse eye removal despite severe intractable pain or the risk of spread of an infection or malignancy[12]. This stud retrieved only cards of patients those underwent DES, so that rate of acceptance was not assessed and it is recommended in future studies.

Research done in one of tertiary hospital in Nigeria show that, the patients who had enucleation and evisceration with fixed customized ocular prosthesis were cosmetically satisfied after one year of follow up as ocular motility in the operated was comparable with the normal fellow eye. This is similar to a multi-center report of north central Nigeria. It was observed that all the patients that had exenteration done were not satisfied and compared with evisceration where all patients were satisfied [13]. There is no data regarding patient satisfaction after DES in our country, i.e. future work is recommended.

1.3 Significance of the Study

There are limited data in our context showing indications for DES. A single study done on this subject matter yet in Ethiopia was in 1995 at `Tor-Hayloch Hospital`. Since then, with socio-political and economic changes over time, the indications for DES may have changed hence a need for another audit. The research was also done in military hospital and can't be generalized for which this study will decrease the gap. Information obtained will be useful to help reduce DES and for further planning and implementation of promotive, preventive, curative and rehabilitative eye care services. Therefore, in order to determine the pattern of destructive eye surgeries in this environment, a retrospective review of all such surgeries will be conducted at JUMC, Jimma, Ethiopia over a period of Four years.

As destructive eye surgery is a traumatizing procedure and frequency relies heavily on quality of care and management of the cause at early stage, it is always imperative to know the common cause of ocular morbidities leading to DES. This study identified the common indications of DES and hence can be used to address preventable causes and controllable causes by early management and possible screening. This helps us to have individualized patient plan which may improves the quality of care given by this center. It will be not only the input for improving patient care but also as a baseline for further study and adds to the existing body of knowledge.

CHAPTER TWO

LITERATURE REVIEW

Study done in **India** to determine the frequency and indications for destructive eye surgeries at a Tertiary level teaching Hospital revealed that All the eyes that underwent DES were blind eye (NLP=36(87.8%), LP=4 (9.75%) and HM=1 (2.43%)). The review showed that, A total of 41 eyes (24 right and 17 left) were surgically removed and there were a higher predilection for male (56%). Mean age was 56.48 (SD-20.73; range 4 to 82 years) with 2 participants being children below age of 15yrs. DES done was Evisceration(87.8%) and enucleation(12%). Common indication found was Infection (53.5%) followed by trauma (19.5%) and neoplasm (12%). There was no exenteration done and no bilateral eye removed in this study subjects [14].

In **Canada**, a retrospective cross-sectional study was done to investigate patient demographics, clinical indications, & pathologic causes of surgically removed eyes over a decade. The study included 713 individuals with a mean age of 60.8±18.5years. Male patients account 52% & were significantly younger compared with female patients (58.0±18.4 vs 64.0±18.1 yrs; P<0.0001). Enucleation is the mostly underwent procedure (60%) & significantly in younger age, followed by evisceration (39%) & exenteration (1%). Blind painful eye (37%), neoplasm (35%), infection/inflammation (6%) & trauma (6%) were among the clinical indications. This study revealed the histopathologic findings of removed eyes to be neoplasms (36%), glaucoma (21%), infection/inflammation (17%), trauma (16%) & other. Majority of neoplasm cases were removed by enucleation (97%) while 72% of infections/inflammation cases by eviscerations. The leading causes of infection related eye removals were endophthalmitis (41%) and keratitis (30%) [15].

On Analysis of Profile of DES at a Tertiary Eye Care Centre in West **Bengal** among 286 patients, 177 (61.89%) were male and 109 (38.11%) were female with a sex ratio of 1.62:1.0. the commonest age group was >60 years (29.37%) with females outnumbering males and age group 15-40yrs comprised the least. Evisceration and enucleation was the most commonly performed procedure holding 74.83% and 24.48% respectively while exenteration accounts only 0.7%. Infective/inflammatory conditions were reported to be the most common indication of DES followed by trauma, neoplasm and staphyloma. They accounts 47%, 18%, 16% and 10% respectively [17].

As per study done by P. Lavaju, *et.al* in **Nepal** to determine the indication of DES on 88 eyes of 88 patients, the mean age of the patient was 22.89 ± 23.49 years and median 9.5 years. Male patients are slightly lower than female patients with ratio of 1:1.04. The type of destructive eye surgery performed were exenteration, evisceration and Enucleation with respective frequency of 13.6%, 34.1% and 52.3%. More than half of cases for which DES done were of children below 15years of age overall & most common type of surgery in children was enucleation (73.91). This study finding shows that neoplasms was the only indication of exenteration and far most (71.7%) indication of enucleation while trauma & ocular infection were most common indications for evisceration together (86.6%). The visual acuity of eyes that underwent DES were; NLP in 73 cases (83%), LP in 9 cases (10.2%), 1/60 in 2 cases (2.3%), 6/60 in 1 case (1.1%), 6/24 in 1 case and 6/12 in 1 case. All patients with VA 1/60 and better were with orbital malignancies [18].

In **Riyadh**, a retrospective descriptive study of DES over 10years period was employed on 110 patients of male predominance (64 vs 46) with mean age of 54 and median age of 50years. Evisceration was more performed than enucleation (63% vs 37%). Postoperative endophthalmitis, Painful blind eye & Ocular tumors are among the commonest cause of non-traumatic indication of DES (65%). Trauma was more predominant in men (76%) than in women (24%). Visual Acuity of majority of patients were NLP and LP, accounted for 82% [19].

A retrospective research conducted in **USA**, Chicago, Illinois University among 107 patients showed that, enucleation was predominantly performed procedure over evisceration (100 vs 7). Males outnumber females with 65.4% and the recruited mean age were 26yr. Among the reported cause of DES, non-traumatic causes were more common than traumatic ones (66 vs 41). Disfiguring painful blind eye was the most common indication of surgery that account 66.4%, followed by Leucocoria and endophthalmitis holding 19.6% and 4.7% respectively. Malignant tumors (retinoblastoma (47.5%), malignant melanoma (27.3%)) were the most common pathological diagnoses followed by phthisis bulbi which account 25.8% [20].

On study done at a tertiary military hospital of **Turkey** on Indications for eye removal surgeries over 15-year period, male patients were majorly encountered making 74.8%. The most commonly used eye removal method in this study was evisceration (77.2%), the rest was

enucleation and no report of exenteration. The study revealed that the mean age was 35.61 ± 18.52 . The mean age of the eviscerated patients was lower, whereas for enucleated patients was higher than total mean and the difference found to be statistically significant. An evaluation of the patients who underwent eye removal showed that the most common surgical indications as trauma, malignancy, painful blind eye and absolute glaucoma, endophthalmitis, phthisis bulbi and cosmetic reasons holding 50.4, 16.3, 16.3, 9.7 and 7.3 percent's respectively. The study found no statistically significant difference in terms of affected eye [21].

In **Ghana**, a 4years retrospective case series study on cause and incidence of DES among 337 eyes of 336 patients with male predominance (64.6%) were done. The recruited data didn't include exenteration. This study found that, the median age of the patients was 35 years with a mean of 36.4 years (SD=23.3). According to this work, infective lesions were the single largest cause of destructive eye surgery (47.9%), followed by ocular injuries, degenerative lesions of the eye-wall and then neoplasms. In case of neoplasms, females were nearly three times more likely to be enucleated while the reverse was so for traumas. Trauma constituted the commonest cause of evisceration or enucleation among under-15years subjects while neoplasms were by far the commonest cause accounting for 65.2% among the under-fives [22].

A 10year review of indication for DES at **Nigerian** tertiary eye care center among 186 eyes of 185 patients indicated Evisceration was the most commonly performed destructive eye surgery done (55.1%) patients, followed by enucleation performed in 29.2% of patients while exenteration was the least performed (15.7%). This review showed that left eye was removed more than right eye (101 vs 83) and both eye removal on one patient sequentially for ruptured globe due to infection. The study revealed male predominance and mean age was 30.1 ± 23.7 years while under-16 years accounted for 33.5%. The VA noticed was, 94.1% eyes had NPL while LP and HM were recorded in 4.8% eyes and 1.1% eyes, respectively. Trauma, tumor and ocular infection were the common indication for DES accounting for 36.2%, 27.6% and 18.4% each. However, tumor (73.2%) was the most common indication in the first decade of life of which RB accounts 92.7% of these [23].

Another 5yr retrospective study in other tertiary hospital of **Nigeria** among 41 patients who underwent DES showed male predominance with 73.2% and the mean age of the patients was 34.4 ± 17.7 years. The adult study subject's occupation was farming (24.4%), artisanship (14.6%), housewives (19.5%), and civil service (12.2%). The VA of all patients found to be NLP on the affected eye at presentation. Evisceration (22), exenteration (16) and enucleation (3) were the procedure performed in order. Neoplasms (41.4%) was the leading cause of DES in this study followed by ocular infections (24.4%) and trauma (24.4%) [24].

According to a retrospective consecutive study done in **Cameron**, among 48 patients who had a recommendation for destructive eye surgery, only 20 patients eye removed with **acceptance rate of 41.7%**. The study showed that Majority of the subjects were male (62.5%), city dwellers (72.9%) and presented with NLP (82.9%). Mean age was 43.78 (SD = 28.11) and under-10 years comprised 23.10%. Endophthalmitis/panophthalmitis (47.9%), neoplasm (20.8%), and absolute glaucoma (14.6%) were the common indications revealed in this study. Evisceration was the most performed surgical procedure (50%) while exenteration done for only one patient. This review also found that, late presentation with 57.1% presenting at least 2 weeks after the onset of symptoms, Conservative therapy was attempted in 60.4% of cases and there was no implant placement [12].

Another study done in rural area of **Cameron** on 253 patients for whom DES was performed over 4years showed male predominance with 58.10%. Median age was 29 years (interquartile range: 14–69 years). All patients presented by NLP of affected eye. Majority of the patients were farmers (67.19%) lived in rural zones and 79.05% of subjects reported using traditional eye medicines and unknown medicines bought from the roadside. DES was indicated as a primary surgical intervention in 69.17% of cases. Evisceration was by far the commonly performed procedure (71.54%) followed by enucleation (27.27%), and exenteration (1.18%). Eye prosthesis was fitted to 93 patients. The most frequent surgical indication of DES was infective causes (perforated corneal ulcer 33.20% (84) and endophthalmitis 18.20% (46)) [25].

A research done in **Zimbabwe** by Mathias Mabvuure Mukona, et al; review a total of 362 patients who underwent destructive eye surgery. The study found male to female ratio of 1.03:1,

median age 38 years and the modal age-group was 21 – 30 years (27%). There were similar proportions of patients from rural and urban areas. In this study, evisceration is the leading type of surgery done (46.13%), followed by exenteration (39.78%) and enucleation (14.09%). The main indication for destructive eye surgery was found to be Ocular Squamous cell Neoplasia (45%), followed by trauma-ruptured globe (22.65%), Panophthalmitis (18.78 %) [26].

A retrospective descriptive study done in **Tanzania** by A V Mara *et al* showed, a total of 306 patients had undergone surgical eye removal from January 2011 to August 2012. Two hundred forty eight case charts with complete information were reviewed and included in the analysis. About 61% of case notes were of male patients. This study revealed that the commonest indications for surgical eye removal were infections (endophthalmitis/panophthalmitis) (35.8%), tumors (24.2%) and trauma (21.4%). Evisceration was the commonest type of procedure underwent for 71.8% of patients; followed by enucleation (19.4%) and exenteration (8.9%). Two hundred thirty three (94.0%) eyes were blind at presentation [27].

A cross-sectional descriptive study done in **Kenyatta** national hospital recruited a total of 261 patients` file of those undergone DES over 5years. 281 eyes data were reviewed and analyzed. Under-10 years of age patients make up almost half of the cases (49.42%) with a higher predilection for male (1.5:1). Unemployed (21.46%), businessman (11.49%) and casual labourers (10.73%) were the commonly affected occupational group next to children (52.11%). Bilateral eye removal was done for 20 patients. This study showed that, 48.66% of cases had intervention prior to DES. The most common type of surgery done was enucleation in 141(50.18%), followed by exenteration in 89(31.67%) and evisceration in 52(18.51%). Tumor was the highest common indication for eye removal (75.48%), followed by trauma and endophthalmitis [29].

A hospital based cross sectional study was conducted on 1992 at Tor hayloch Hospital, **Ethiopia** by Haile M. and Alemayehu W. to observe the Cause of removal of the eye. In this study, males outnumber females with 2.2:1 ratio. The causes of removal of the eye in 282 patients were presented & the most common causes were: traumatic globe rupture (33%), malignancy (21%), ugly corneal staphyloma (11%) and panophthalmitis without external cause (11%). As observed in the review, causes of removal of the eye slightly decrease with increasing age [11].

CHAPTER THREE

OBJECTIVE

3.1. GENERAL OBJECTIVE

To assess the patient characteristics and patterns of destructive eye surgery done from May 2017 to August 2022G.C at Ophthalmology Department of Jimma University Medical Center.

3.2. SPECIFIC OBJECTIVE

- 3.2.1. To assess the Indications of destructive eye surgery.
- 3.2.2. To determine the patterns of destructive eye surgery.
- 3.2.3. To identify the characteristics of patients in the study.
- 3.2.4. To assess post eye removal interventions.

CHAPTER FOUR

METHODOLOGY

4.1. Study Area

The study was conducted in Jimma University Medical Center (JUMC) Ophthalmology department. JUMC is one of the oldest public hospitals in the country and previously it was the only teaching and referral hospital in the southwestern part of the country. Geographically, it is located in Jimma city 352 km southwest of Addis Ababa. JUMC is the only tertiary hospital in south western Ethiopia and has a well-organized ophthalmic center which is manned by qualified ophthalmologists, trainee ophthalmologists, ophthalmic nurses and Optometrists. Ophthalmology Department is among the only seven specialty training centers in the country.

4.2. Study period

The medical records of patients who underwent DES from May 2017 to Aug. 2022 were reviewed. Data collection was conducted from August 30, 2022 to September 29, 2022G.C

4.3. Study Design

A retrospective descriptive study design was employed.

4.4. Population

4.4.1. Source population

The source population was all patients who underwent Destructive eye surgery at Jimma University Medical Center during the period of May 2017 to August 2022G.C

4.4.2. Study population

All patients that fulfill inclusion criteria

4.5 Inclusion and exclusion criteria

Inclusion criteria: All the patients who had undergone destructive eye surgery at JUMC at the time of the study.

Exclusion criteria: Patients with incomplete or missed medical records.

Patients who had undergone eye removal surgery elsewhere.

4.6 Sample size and sampling technique

All case files during the study period were included. Sampling technique was not used.

4.7. Variables

4.7.1. Independent variables

- ✓ Age
- ✓ Sex
- ✓ Address
- ✓ occupation
- ✓ Duration of presenting complaint
- ✓ Indication of surgery
- ✓ Trauma
- ✓ Inflammation/Infection
- ✓ Neoplasm
 - Retinoblastoma
 - SCC
 - Orbital Neoplasm
- ✓ painful Blind eye
- ✓ Staphyloma
- ✓ Partially eviscerated
- ✓ surgeons
- ✓ Usage of implant
- ✓ Provision of prosthesis

4.7.2. Dependent variable

- ✓ Destructive eye surgery

4.8. Data collection technique

Patients chart number was obtained from major and minor operation room surgical records and the patients chart were retrieved from card room. A Questionnaire which contains variable to be measured was employed. Training on how to collect the necessary information from the patient chart was given for data collectors by the principal investigator. After obtaining permission to conduct the study, data was collected with data collection format by ophthalmology residents from patients chart. Patients Chart number was used to avoid repetition.

4.9. Data quality control

The investigator was supervising during the data collection, to ensure the quality of data by checking filled formats for their completeness and consistency.

4.10. Data Analysis

Data was cleaned, edited, compiled and checked for completeness and consistency. Then data was entered to Epidata version 3.1 and then exported to SPSS version 25 for analysis. Descriptive analysis was done. Measures of central tendency and measures of deviation was done for continuous variables. Frequency distributions and percentages were done for categorical variables. χ^2 test was used to determine the significance of association of variables. One-way- ANOVA test was used to compare means of continuous and categorical variable. A 95% confidence interval was used and p-values <0.05 was considered statistically significant. Result was presented using number, ratio, tables and graphs.

4.11. Operational definitions

Destructive eye surgery: Surgical removal of ocular contents (Evisceration), the entire globe with a segment of the optic nerve (Enucleation) and entire globe and either portions or all of the orbital components (Exenteration).

Globe Rupture: Full-thickness wound/break of the eyewall, caused by a blunt object.

Penetrating eye injury: single laceration (no exit point) of the eyewall

Perforating eye injury: two full-thickness lacerations (entrance and exit) of the eyewall.

Painful Blind eye: visual acuity worse than 3/60 that has no realistic probability of recovering function and is accompanied by ongoing chronic pain and ongoing discomfort which has lasted for at least 4weeks.[30]

Partially Eviscerated: spontaneous or traumatic globe rupture with coming out of part of intra ocular contents that is un-salvageable.

BCVA WHO Classification of Visual impairment;

- Mild –visual acuity worse than 6/12 to 6/18
- Moderate –visual acuity worse than 6/18 to 6/60
- Severe –visual acuity worse than 6/60 to 3/60
- Blindness –visual acuity worse than 3/60

Spontaneous globe rupture: Full-thickness eye coat wound with no history of trauma at time of rupture.

Orbital implant: medical prosthetics used to replace the orbital volume and allow some amount of realistic movement of a prosthetic eye following enucleation or evisceration.

Orbital Prosthesis: artificial eye/glass eye is a type of craniofacial prosthesis that replaces an absent natural eye following an enucleation, evisceration, or orbital exenteration. The prosthesis fits over an orbital implant and under the eyelids.

Incomplete medical record: patient`s medical record that have no documentation of history of presenting illness, physical examination and procedure note.

4.12. Ethical Consideration

Ethical approval was obtained from the institutes ethical review committee. To conduct our study, the concerned body of JUMC was informed about the objective of the study by formal letter which was obtained from Jimma University CBE Office. Confidentiality of the information was assured. The information and the questionnaire were only accessible to people involved in the study.

CHAPTER 5

RESULTS

A total of 184 eye removals were analyzed from 183 patient files within the study period where 1 patient had two different surgeries for recurrence of the disease.

5.1 Sociodemographic data

5.1.1 Gender Variation

Most patients, who underwent DES, were male (108/183) making male to female ratio 1.4:1 with a higher predilection for male gender (p-value=0.022) as shown in figure 1 below.

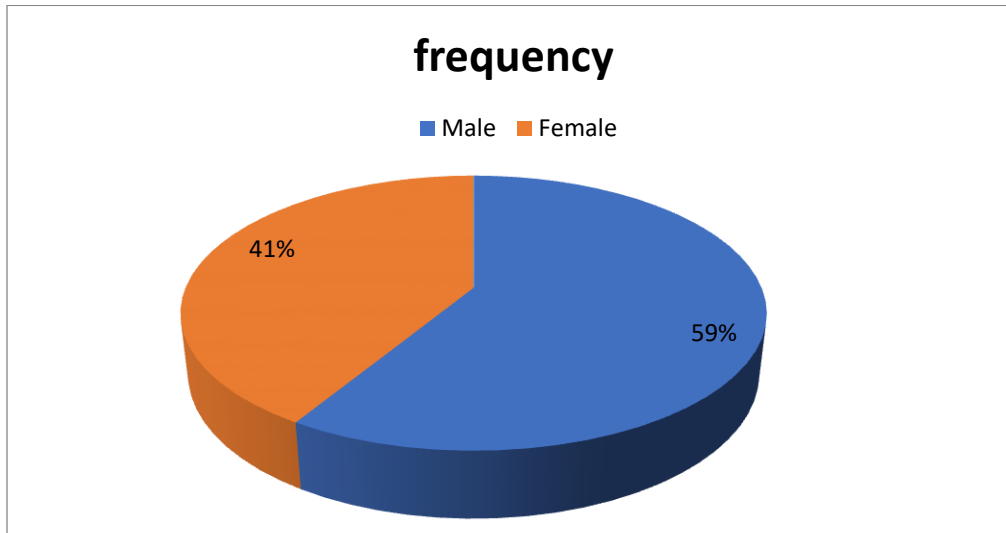


Figure 1: Gender variation of patients with DES at JUMC, November 2022.

5.1.2 Age distribution and Address of Patients

The mean age of patient was 40.04 years, SD =22.27, ranging from 2month to 85years with median age of 40 years. As shown on figure 2 below, Most eye removals were in patients aged between 41-60years old (30.4%), followed by patients in age category of 21-40years old (27.2%). The least age group was above 60yrs (19%). The interquartile range (IQR) for the age distribution was 56-24.25=31.75years.

Slightly higher patients were from out of jimma zone which accounts for 52.2% but not statistically significant (p =0.606).

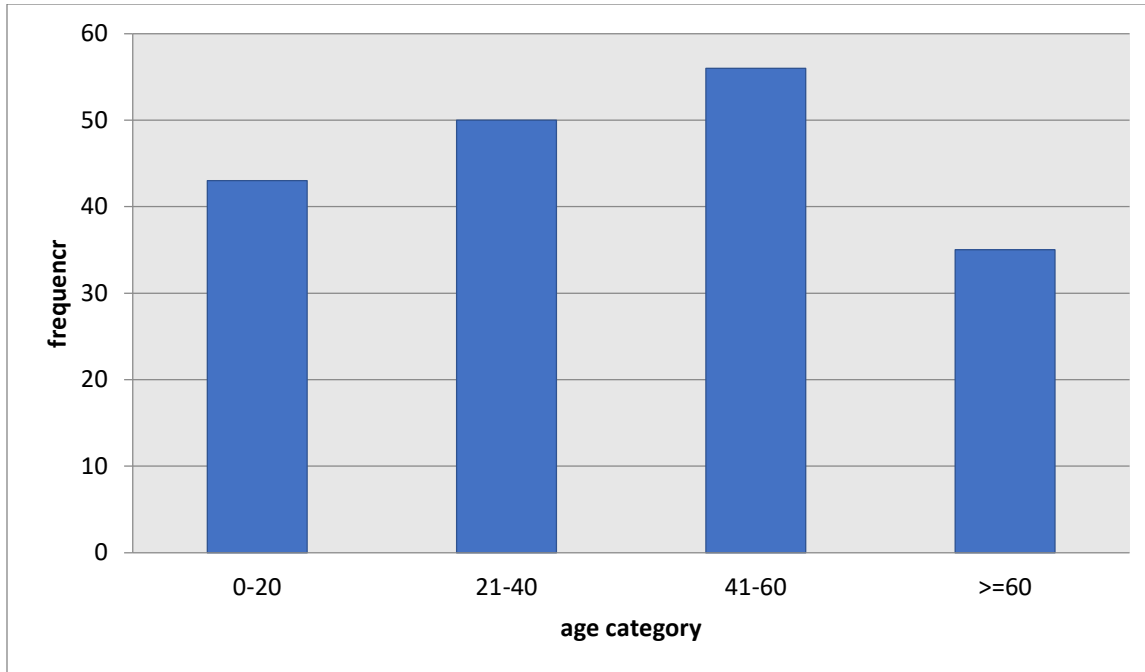


Figure 2: Age distribution of patients with DES at JUMC, November 2022.

5.2 Patients Clinical record

5.2.1 Pattern of eye removal according to laterality and presenting VA

Nearly equal proportions (50.5% vs 49.5%) of right and left eyes were removed, $p=0.941$. Among patients presented with VA \geq HM, 3 patients had count finger at 1meter, 1 patient had CF@2meter, 1 patient had VA of 6/30 (but later became NLP) and 1 patient presented with VA of 6/7.9. Those 6 patients were presented by ocular neoplasia and histopathology result found to be SCC.

Table 1: laterality and VA of patients with DES at JUMC, November 2022.

Variable	Frequency	Percent
Right	91	49.5
Left	93	50.5
Total	184	100.0
VA		
NLP	136	73.9
LP	24	13.0
\geq HM	16	8.7
Not documented*	8	4.3
Total	184	100.0

*Not documented includes uncooperative patients

5.2.2 Prior intervention

Intervention was given for 75(40.76%) patients prior to destructive eye surgery. As shown on the table below, majority of patients presented with ocular infection were on antibiotic treatment prior to eye removals. Nine (4.89%) patients developed recurrence after excisional biopsy for which DES was done later. Only 3 patients with RB case had chemo reduction therapy prior to surgery. One patient, for whom enucleation was done, developed recurrence of RB and total exenteration was done 7 months after primary surgery. Uveitic cataract was the working diagnosis of one patient for which she was taking cycloplegics and topical steroid. By suspicion of RB on CT-scan image, enucleation was done and histopathology result found to be RB. Secondary DES was done on two patients (1.08%), for one patient after IOFB removal plus scleral repair and the second patient after corneal repair for developing ocular infection.

Out of 61 patients with ocular infection, evisceration was done for 10 patients within 1days of presentation without any prior interventions. There was no intervention prior to removal of the eye for 59.24% of patients.

Table 2: Prior Intervention for patients with DES at JUMC, November 2022.

Diagnosis		Intervention given		
	frequency		frequency	(%)
Neoplasia				
Retinoblastoma	11	chemotherapy	3	1.63%
		Other	2	1.08%
SCC	14	Excisional biopsy	9	4.89%
		Other	1	0.54%
Other	5	exploration	1	0.54%
Staphyloma	39	Conj. flap	1	0.54%
Ocular Infection	61	Antibiotics*	50	27.17%
		IOFB removal +scleral repair	1	0.54%
Trauma	19	repair	1	0.54%
Painful Blind eye	11	RBA injection	6	3.26%
Other		No intervention	109	59.24%

*antibiotics included intravitreal, intravenous and topical.

5.2.3 Duration of presenting compliant and interval from presentation to surgery.

The average duration of presenting compliant was 257.4days (SD=629.993) with median of 30days. The range of duration of presenting compliant was from one day to ten years.

Forty years old and younger patients were stayed longer with their compliant than older counterpart, but It found to be not statistically significant with $p=0.087$. Patients with staphyloma took longer time to seek health facility (728.87 ± 1069.935) while patients with open globe injury (6.11 ± 8.615 days) came by far earlier than others ($p <0.001$) as shown on Table 3 below. As shown on figure 3 below, 20(10.9%) patients were presented within one day of compliant, 28(15.2%) patients were presented b/n 2-7days and 15.2% of patients were presented within one to two week of their compliant. Twenty one (11.4%) patients were presented after 1year of their compliant.

As shown on Table 4 below, patients presented by spontaneous globe rupture (1.11 ± 0.32) and open globe injury (2.74 ± 4.36) underwent eye removal earlier, followed by Patients presented by ocular infection who were operated at 16.08 ± 26.22 days of presentation. There is a statistically significant difference in mean of time delays among indications of DES.

Table 3: Duration of presenting compliant (days) vs surgery indications and age of patients with DES at JUMC, November 2022.

Indication For Surgery	Mean	N	Std. Deviation
Neoplasm	230.97	30	368.276
Painful blind eye	530.46	13	847.743
Ocular infection	45.20	60	113.592
spontaneous globe rupture	71.29	17	124.901
Open globe injury	6.11	19	8.615
Staphyloma	728.87	38	1069.935
Total	257.41	177	629.993
Age category			
=<20	383.33	42	758.666
21-40	296.67	48	790.319
41-60	172.25	56	484.527
>60	179.87	31	297.401
Total	257.41	177	629.993

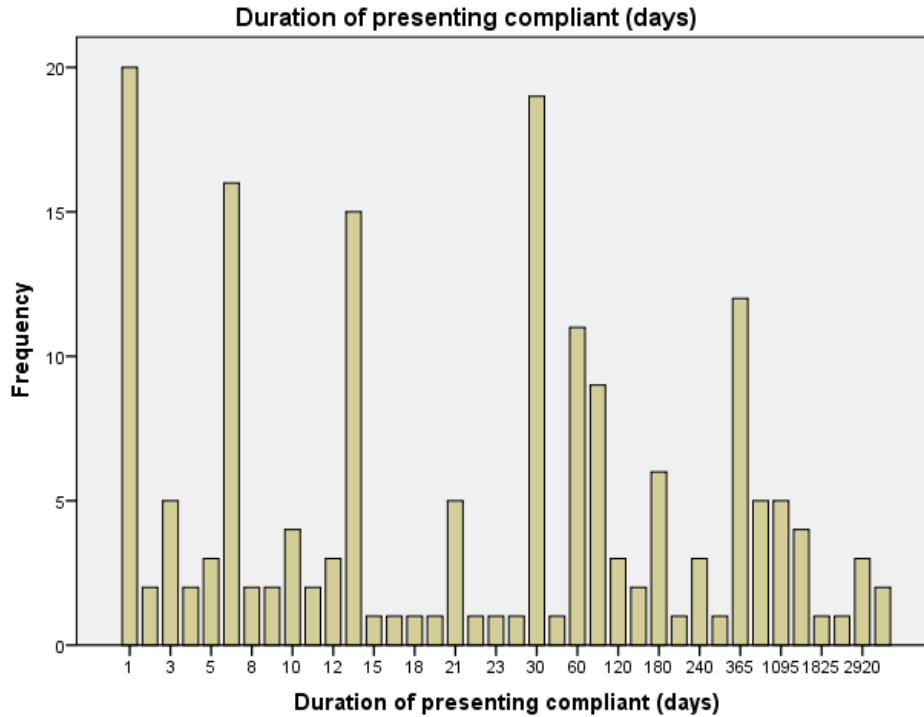


Figure 3: Duration of presenting compliant of patients with DES, November 2022.

Table 4: Time lapse (days) from presentation to surgery of patients with DES, November 2022.

	N	Mean	SD	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Neoplasm	29	84.17	126.789	23.544	35.94	132.40	1	485
Painful blind eye/absolute glaucoma	16	59.81	114.951	28.738	-1.44	121.07	1	365
Ocular infection/inflammation	61	16.08	26.215	3.356	9.37	22.80	1	150
spontaneous globe rupture	18	1.11	.323	.076	.95	1.27	1	2
Open globe injury	19	2.74	4.357	1.000	.64	4.84	1	19
Staphyloma	39	45.18	96.383	15.434	13.94	76.42	1	465
Total	182	34.13	81.054	6.008	22.28	45.99	1	485

5.2.4 Indications and type of Destructive Eye surgeries

The greatest proportion of procedure done was evisceration 153(83.15%), followed by enucleation 16(8.70%) while the least was exenteration 15(8.15%) ($\chi^2=205.511$, $df=2$, $p<0.001$). Out of 15 patients that underwent exenteration, 13 patients exenteration were recommended for SCC, one patient was operated for recurrent retinoblastoma after 7month of enucleation done and one patient was operated for invasive eyelid Basal cell carcinoma involving the globe. Majority of the exenteration done were subtotal type which accounts for 80%, the rest was total exenteration (20%). Extended type of exenteration done was not found. No patient was found having both eye removals.

Among 16 patients for whom enucleation was done, RB accounted for 71.4% of the 14 neoplasia cases that had enucleation and all patients with RB case were in the first decade of life. The remaining indications of enucleation were ocular neoplasia (4), Trauma (1) and staphyloma (1). For one patient presented by OSSN, evisceration with scleral resection was done.

Table 5: Indications versus Type of DES done at JUMC, November 2022.

		Type of Destructive procedure done			
		Evisceration	Enucleation	Exenteration	Total
Indication For Surgery	Neoplasm				
	Retinoblastoma	-	10(5.43%)	1(0.54%)	11(5.98%)
	SCC	-	1(0.54%)	13(7.06%)	14(7.61%)
	Other	1(0.54%)	3(1.63%)	1(0.54%)	5(2.72%)
	Painful blind eye	17(9.24%)	-	-	17(9.24%)
	Ocular infection	61(33.15%)	-	-	61(33.15%)
	spontaneous globe rupture	18(9.78%)	-	-	18(9.78%)
	Open globe injury	18(9.78%)	1(0.54%)	-	19(10.33%)
	Staphyloma	38(20.65%)	1(0.54%)	-	39(21.19%)
Affected eye	Right	71(38.59%)	12(6.52%)	8(4.35%)	91(49.45%)
	Left	82(44.57%)	4(2.17%)	7(3.80%)	93(50.54%)
Gender	male	92(50%)	6(3.26%)	10(5.43%)	108(58.70%)
	Female	61(33.15%)	10(5.43%)	5(2.72%)	76(41.30%)
	Total	153(83.15%)	16(8.70%)	15(8.15%)	184(100%)

There were more male patients (50%) who had undergone evisceration compared to female patients (33.15%) whereas there were more female patients who had undergone enucleation compared to male patients. As shown on Table 5 above, left eye were removed more frequently than right eye (44.57% vs 38.59%) in patients who had underwent evisceration, whereas right eye more frequently removed than left eye (6.52% vs 2.17%) in enucleation. Male patients

outnumber female patients in almost all of clinical indications of DES as shown on figure 4 below.

The mean age of the patients who underwent evisceration (n=153) was 41.50 ± 20.69 and the mean age of the patients who underwent enucleation (n=16) was 16.22 ± 23.92 whereas the mean age of the patients who underwent exenteration (n=15) was 50.53 ± 20.81 . The age difference between the patients who underwent evisceration and enucleation was found statistically significant ($p=0.002$). Enucleation and exenteration patients age difference also found statistically significant ($p=0.001$) while age difference among evisceration and exenteration patients was statistically not significant ($p=0.271$).

Patients presented by spontaneous globe rupture were older than others with mean age of 58.50 ± 14.15 years while patients diagnosed with staphyloma were younger (25.47 ± 18.17). The inter group age mean difference found to be statistically significant ($p < 0.001$).

As shown on table 6 below, neoplasm and staphyloma were the commonest indication of DES in under 20 years age group. Three fourth of the enucleation done was also in this age group. More than $3/4^{\text{th}}$ of SCC observed as indication of DES was found in above 40 years old. Two third of exenteration done was found to be in this age group. Ocular infection as an indication and evisceration as a type of DES was largely observed between 41-60 years & 21-40 years age group.

Table 6: Indications and type of DES by age, November 2022.

		age category				Total
		=<20	21-40	41-60	>60	
Indication For Surgery	Neoplasm	12	4	7	7	30
	Retinoblastoma	11	0	0	0	11
	Squamous cell carcinoma	1	2	6	5	14
	Other	0	2	1	2	5
	Painful blind eye	1	5	6	5	17
	Ocular infection	4	22	23	12	61
	spontaneous globe rupture	0	3	6	9	18
	Open globe injury	6	4	9	0	19
	Staphyloma	20	12	5	2	39
	Total	43	50	56	35	184
Type of Destructive procedure done	Evisceration	29	46	49	29	153
	Enucleation	12	1	2	1	16
	Exenteration	2	3	5	5	15
	Total	43	50	56	35	184

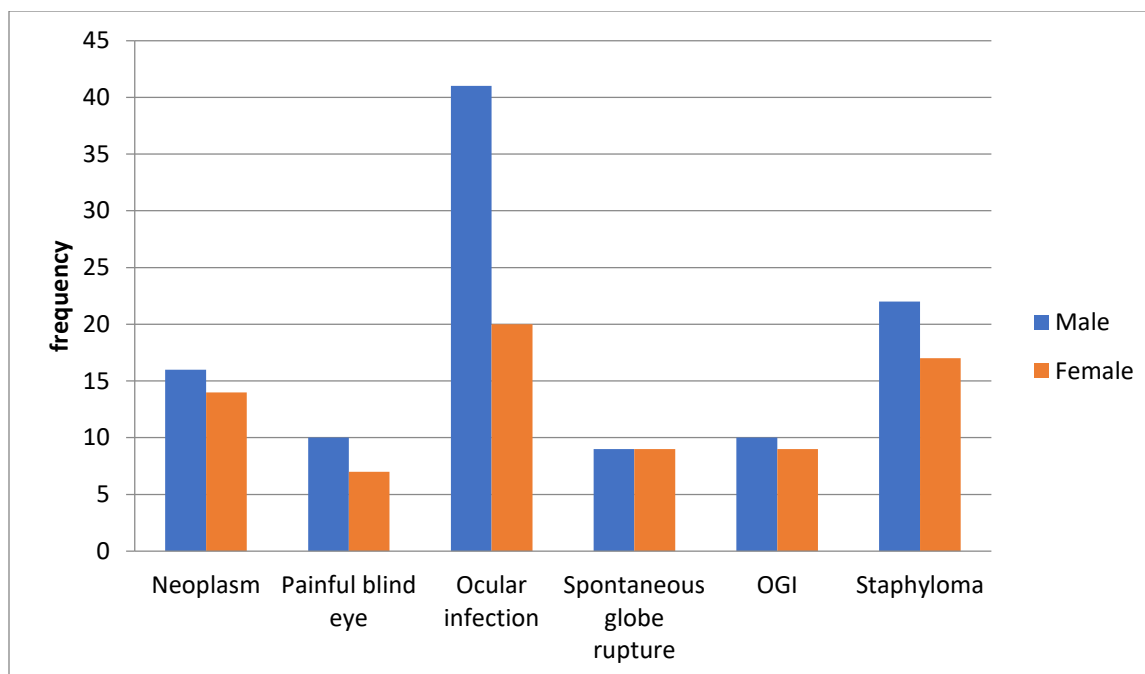


Figure 4: Indication vs gender of patients with DES at JUMC, November 2022.

5.2.5 Implant and prosthesis

All exenteration and enucleation were done by ophthalmologist and large number of evisceration was done by ophthalmology residents. Local anesthesia was used for 1 case of enucleation and 3 cases of exenteration while GA used for the rest of enucleation and exenteration. As shown on Table 7 and 8 below, Implant was inserted for 28(16.57%) patients, of which 64% were for ≤ 20 year age group. Only 11(5.97%) patients were provided with eye prosthesis. No patient above 60 years old and who underwent exenteration were given prosthesis.

Table 7: Procedures and subsequent mgt of patients with DES at JUMC, November 2022.

		Type of Destructive procedure done			Total
		Evisceration	Enucleation	Exenteration	
Who did the procedure	Ophthalmologist	12(6.52%)	16(8.70%)	15(8.15%)	43(23.37%)
	Ophthalmology Resident	78(42.39%)	-	-	78(42.36%)
	Ophthalmic Nurse	63(34.24%)	-	-	63(34.24%)
Type of anesthesia used for the procedure	Local anesthesia	138(75%)	1(0.54%)	3(1.63%)	142(77.17%)
	General anesthesia	15(8.15%)	15(8.15%)	12(6.52%)	42(22.82%)
If DES done is Enucleation/Evisceration, Is orbital Implant placed?		Evisceration	Enucleation		
	yes	24(14.20%)	4(2.37%)		28(16.57%)
	No	129(76.33%)	12(7.10%)		141(83.43%)
	Total	153(90.53%)	16(9.47%)		169(100%)

Is prosthesis provided	Evisceration	Enucleation	Exenteration	
yes	9(4.89%)	2(1.08%)	-	11(5.97%)
No	3(1.63%)	7(3.80%)	2(1.08%)	12(6.52%)
Not documented	141(76.63%)	7(3.80%)	13(7.06%)	161(87.5%)
Total	153(83.15%)	16(8.70%)	15(8.15%)	184(100%)

Table 8: Implant and prosthesis placement by age, November 2022.

If DES done is Enucleation/Eviscerati on, Is orbital Implant placed?		Age category				Total
		=<20	21-40	41-60	>60	
If DES done is Enucleation/Eviscerati on, Is orbital Implant placed?	yes	18	7	1	2	28
	No	23	40	50	28	141
	Total	41	47	51	30	169
Is prosthesis provided	yes	5	5	1	0	11
	No	6	2	2	2	12
	Not documented	32	43	53	33	161
	Total	43	50	56	35	184

5.2.6 Patterns/trends of cases over study period

The number of Enucleation and Exenteration done per year increased over year. There was a significant decrement in number of evisceration done in 2019/20 which might be due to decreased patient flow to our center during Covid-19 outbreak.

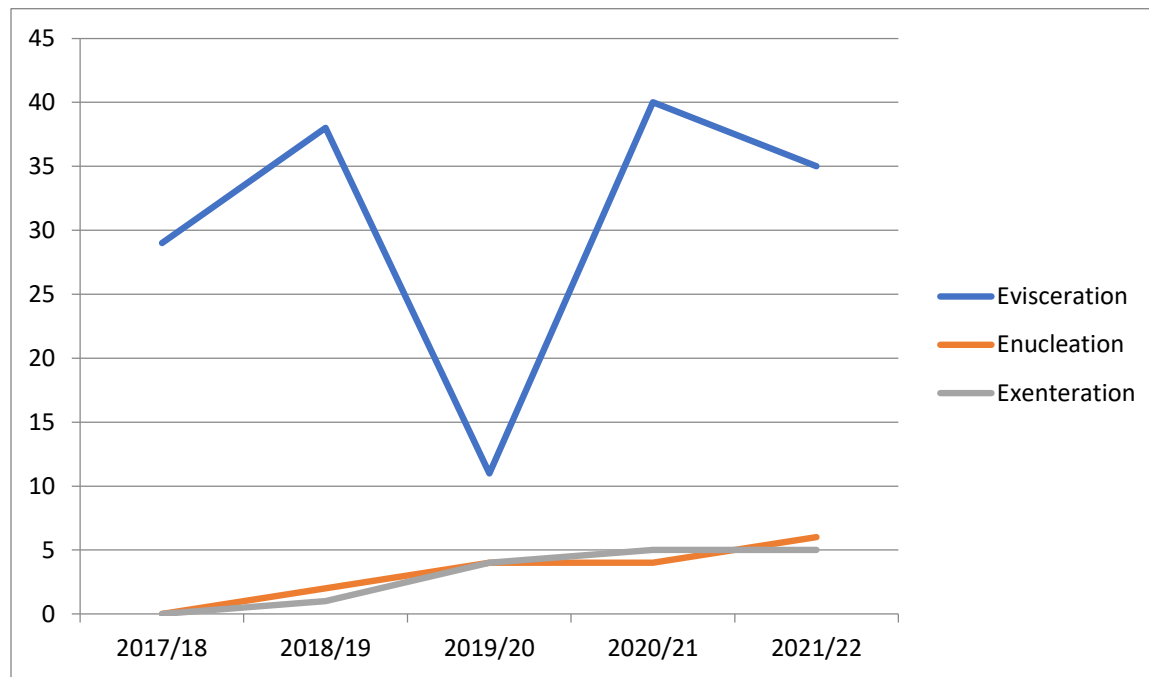


Figure 5: Trends of DES over study period, November 2022.

CHAPTER SIX

DISCUSSION

The study sought to review the indications for destructive eye surgeries at JUMC, the only referral hospital in southwest Ethiopia. A total of 184 eye removals over the 5year study period from May 2017-august 2022 were recruited, of whom (59%) were male and (41%) were female with a ratio of 1.4:1. The mean age of patients who underwent destructive eye surgeries in our study was 40.04 years, SD = 22.27 with median age of 40years. This finding is comparable to the 43.78years and 36.4 years reported by Eballé *et al* and Gyasi, M. *et al* (12, 22).

The visual acuity of eyes that underwent DES were; NLP in 136 cases (73.9%), LP in 24 cases (13%), HM in 10 cases (5.43%), CF@2m in 3 cases (1.63%), CF@2m in 1 case (0.54%), 6/30 in 1 case and 6/7.9 in 1 case. Patient with presenting vision of 6/30 was later found to have NLP during decision for surgery. All patients with VA better than HM were with orbital malignancies. This is in line with the study done by P. Lavaju, *et.al* in Nepal (18). In a study by Musa K.O in Nigeria, 94.1% eyes had NPL while LP and HM were recorded in 4.8% eyes and 1.1% eyes, respectively (23). Patients with staphyloma take longer time to seek health facility while patients with open globe injury came by far earlier than other indications of DES with 6.11days, SD=8.615days. Only 41.5% of patients presented within 2 week of compliant onset, which is lower than study done in Cameron that found late presentation with 57.1% presenting at least 2 weeks after the onset of symptoms (12).

Intervention prior to destructive eye surgery was given for 75(40.8%) patients in our study which is lower compared to 48.66% of study result observed in Kenya and 60.4% of study result In Cameron (12, 29). It is B/c more patients with infection and trauma presented to our center at unsalvageable stage.

The most common indication for a destructive eye surgery in our study was infection (33.15%) and the leading cause among both males and females. This is consistent with the findings in previous studies; from some parts of India (Noronha, D., *et al*), Bengal (Chakraborti, C., *et al*), Riyadh (Al-Dahmash, S.A., *et al*), Ghana (Gyasi, M. *et al*), Cameron (Eballé, A.O., *et al*) and Tanzania (Maro, A. *et al*), but contrasts with observations from previous study in Ethiopia done by Haile, M.*et al*, study in Nigeria done by Musa, K.O., *et al* and in Turkey revealed by Koylu, M.T., *et al* where ocular trauma was documented to be the most common indication (14, 17, 19, 22, 12, 27, 11, 23, 21). In our study, infection was higher in age group of 41-60 followed by 21-40years of age which contrasts with study in India where infection was predominant after the age of 60 years.

Among the 61 patients with ocular infection, 25(41%) of them were post traumatic/post-surgical infection. However, study in Cameron shows that all cases of intraocular infections were secondary to trauma; there was no cause of postoperative endophthalmitis requiring eye removal (12). Majority of the infections for which DES was done were either endophthalmitis or panophthalmitis. The high prevalence of severe intraocular infections leading to indications for eye removal could be related to the practice of self-medication among city dwellers and the use of traditional eye medicine by the rural population. Low awareness on eye health coupled with the non-availability of free health care delivery, probably leading to late presentation more so that only close to 15% of these patients presented prior to 1week of the onset of symptoms might also contribute.

Staphyloma (21.19%) was the second leading causes for DES in our study in contrast to prior study done in Ethiopia which accounts 11% and Nigeria (11, 23). It accounts slightly higher in male in contrast to study done in Nepal and Kenya (18, 29). We found that, 51.3% of patients with staphyloma were <10 years old which is consistent with study in Nepal (18). In our study, Neoplasia (16.30%) was the 3rd most common indications for eye removals, which is in parallel with study done in India, Bengal and Riyadh, but neoplasia was the leading cause of DES as revealed by study done in Nigeria by Muhammad, A.D. *et al*, in Zimbabwe by Mukona, M.M.*et al* and study done in Kenya by Dawodu, O. *et al* (24, 26, 29). We found that SCC was the common indication among neoplasia followed by RB, in contrast to study report in Kenya, Nepal and Nigeria where RB was the commonest neoplasia and was in under 10yaers old (29, 18, 24). Open globe injury (10.33%), spontaneous globe rupture (9.78%) and painful blind eye (9.24%) were observed indications for DES in our study. Large observation of staphyloma and spontaneous globe rupture shows low awareness of eye health care and poor seeking of eye health services in the community which should be improved.

In our study, Evisceration was the most performed procedure in 83.2% followed by Enucleation (8.7%) and Exenteration (8.2%). Similar study in Tanzania by A V Mara *et al* shows that, evisceration is the most commonly performed procedure (71.8%) followed by enucleation (19.4%) and exenteration (8.9%). Study by Noronha, D., *et al* done in India also found that, evisceration (87.8%) was the most performed surgical procedure followed by Enucleation (12%) and no observed exenteration case. Koylu, M.T., *et al* revealed the same result by his work in Turkey that, evisceration account for 77.3%, the rest is enucleation and no report of exenteration. Ocular infection was the major indications for evisceration which shares similarity with study in Tanzania, India and Cameron (12, 14, 27). Evisceration with scleral resection procedure was performed for 1case of OSSN.

In our study, Enucleation was the second most commonly performed destructive eye surgery. Neoplasia was found to be the most common reason for enucleation with

Retinoblastoma found to be the commonest tumor, which is in agreement with the findings of Musa, *et al* in Nigeria. The same finding was reported in India by Noronha, D., *et al*. This is also consistent with observations in previous studies from other developing countries. Choroidal melanoma was the most common indication for Enucleation on study report by Noroha, D., *et al* in India. In this study, all Retinoblastoma case was presented in first decade of life and the only tumor identified in this age group (14, 27).

Exenteration in our study constituted 8.2% of all cases and this is much lower than study result done by Dawodu, O. *et al* in Kenya (31.16%) and report by Mukona, M.M. *et al* in Zimbabwe (39.8%). The main indication for exenteration in our study was squamous cell carcinoma (7.06%) which is in line with, but much lower than report by Dawudo, *et al* (25.27%) and report by Mukona, M.M. *et al* in Zimbabwe (35.4%). In our study, out of 15(100%) patients with exenteration, 1(6.67%) patient was presented with advanced retinoblastoma. As study by Eballe, A. O, *et al* in Cameron, The lone case of exenteration was done following recurrence of RB after earlier enucleation. In contrast, in study done in Nigeria by Musa, K. O, *et al*, 29 (100%) patients who had their eyes exenterated were due to tumors involving the orbit, of which 18 (62.2%) were advanced retinoblastoma (12, 23, 26, 29).

In our study we found that, Implant was inserted for only 28(16.57%) patients. In contrast, No implant was inserted on study done in Cameron by Eballe, A. O, *et al*. According to study done in USA by Yousuf, S.J. *et al*, implant placement was found to be in 98% of cases. No available Literature reporting Implant placement in setup comparable to our center was found. Among the 28 implant placed eyes, 16(57.14%) were for male patients and the same number was for under ten age group of patients (4, 12).

In our study only 11(5.97%) patients (6 male and 5 female) were provided with eye prosthesis. Giles k. *et al* reported on his study in Cameron that Removable acrylic prosthesis was fitted only to 36.75% of patients (25). No patient had both eyes removed in our study.

CHAPTER SEVEN

CONCLUSION

The most common indication for destructive eye surgery in our setting was eye infection and staphyloma, which could thus be largely avoidable through early presentation, prompt diagnosis and treatment. Staphyloma and Retinoblastoma were the major indication of DES in less than 20 year of age. Destructive eye surgery significantly affects the economically productive age group of individuals. The most common type of destructive eye surgery was evisceration followed by enucleation and the least was exenteration. In our study, there were few patients with implanted eyes and placed eye prosthesis due to scarcity of Implants and fitting eye prosthesis. Our exenterated patients have no access to orbital prosthesis because it was not yet available in our center which is an area to be explored and addressed.

RECOMMENDATION

Avoidable cases were the leading indications of DES in our study. Therefore, preventive measures must be carried out to mitigate eye morbidity. These include providing extensive health education to the public on the risks linked to patients' late presentation to the clinic; providing education to non-ophthalmologic health care workers at the primary care level; providing quality control of the surgery; and offering postoperative care.

Finally, there is need to provide orbital implants and good fitting prosthesis for good cosmetic appearance especially in children who are prone to facial asymmetry as well as reduction of the psychological trauma of losing an eye and to reduce the social outcast effect. JUMC should improve keeping patient records and to computerize all patient file.

LIMITATION

Tracing files was a challenge due to poor record keeping.
Most of the patient cards were missing.

Annex I

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Annex II

Questionnaires

Jimma University Institute of Health Science Department of Ophthalmology

The aim of this study is to assess patient characteristics and patterns of Destructive eye surgeries underwent in JUDO, Jimma University medical center.

Questionnaire

Demographic Information:

1. Card No _____
2. Age _____
3. Gender
 - a. Male
 - b. female
4. Address
 - a. Jimma zone
 - b. Outside Jimma zone
5. Date of presentation _____
6. Date of Surgery done _____

Patients Clinical Record:

7. Diagnosis at admission _____
 - a. Anterior staphyloma
 - b. SBK/Fungal keratitis
 - c. Endophthalmitis/Panophthalmitis
 - d. Intraocular/orbital mass
 - e. Painful blind eye
 - f. Spontaneous globe rupture
 - g. OGI
8. Presenting visual acuity
 - a. NLP
 - b. LP
 - c. \geq HM
 - d. Not documented/not cooperative
9. Duration of presenting complaint(in days) _____
10. Affected eye
 - a. Right
 - b. Left
 - c. Both
11. Intervention prior to destructive eye surgery

- a. Chemotherapy
 - b. Antibiotics
 - c. Retrobulbar absolute alcohol injection
 - d. Repair
 - e. Excisional biopsy
 - f. Conjunctival flap
 - g. Other, specify_____
 - h. Not done/not documented
12. Indication for surgery
- a. Neoplasm
 - b. Painful blind eye/Absolute Glaucoma
 - c. Phthisis bulbi and cosmetic reasons
 - d. Ocular infection/inflammation
 - e. Spontaneous globe rupture
 - f. Open globe injury
 - g. Staphyloma
13. If answer for question 14 is Infection
- a. Post-traumatic endophthalmitis/keratitis
 - b. Non traumatic eye infection
14. If answer for question 14 is Neoplasms,
- a. Retinoblastoma
 - b. Squamous cell carcinoma
 - c. Other neoplasms, specify_____
15. If answer for question 14 is Open globe injury, Type of OGI
- a. Penetrating
 - b. Perforation
 - c. Ruptured globe
 - d. IOFB
16. What type of DES done for Open globe injury?
- a. Primary enucleation/evisceration
 - b. Secondary enucleation/evisceration
17. If DES is secondary procedure, what kind of primary surgery was done?
- a. Corneal repair
 - b. Corneal and limbal repair

- c. Corneal & scleral repair
 - d. Scleral repair
 - e. IOFB removal
 - f. IOFB removal and globe repair
 - g. Repair and Cortex wash/ lensectomy
18. Type of destructive procedure done
- a. Evisceration
 - b. Enucleation
 - c. Exenteration
19. If Exenteration done, Type
- a. Sub-total
 - b. Total
 - c. Extended
 - d. Not documented
20. Laterality of Surgery
- a. Unilateral
 - b. Bilateral
21. Who did the procedure
- a. Ophthalmologist
 - b. Ophthalmology resident
 - c. Ophthalmic nurse
22. Type of anesthesia used for the procedure
- a. Local anesthesia
 - b. General anesthesia
23. Time lapse from presentation to surgery(days)_____
24. If DES done is enucleation/evisceration, is orbital Implant placed?
- a. Yes
 - b. No
 - c. Not known/documented
25. Is prosthesis provided
- a. Yes
 - b. No
 - c. Not known/documented

STATEMENT OF DECLARATION OF PRINCIPAL INVESTIGATOR

I, the undersigned, agree to accept responsibility for the scientific, ethical and technical conduct of the research project and provision of the required progress reports as per terms and conditions of the SRP in effect at time. Grant is forwarded as the result of this application.

Name of the student: Dr. Gudina Milkessa (MD)

Signature -----Date of submission-----

APPROVALS OF THE ADVISORS

1. Name of the advisor: -----

Signature_____

2. Name of the advisor: -----

Signature_____