Paracentesis as Surgical Intervention in Traumatic Hyphaema: Opinions and Practices of Nigerian Ophthalmologists

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Abstract

Introduction: Various aspects of management of traumatic hyphaema are enmeshed in controversy. Surgery is done to prevent complications: optic atrophy and corneal blood staining occurring if a high risk exists of either or both occurring. Circumstances considered high risk do not enjoy universal consensus.

Objectives: To determine what Nigerian ophthalmologists consider absolute indications for surgical intervention by means of anterior chamber paracentesis and hyphaema washout in closed globe traumatic hyphaema, evaluate these absolute indications, and attempt to evolve a guideline for surgical intervention based on areas of consensus and disagreement.

Method: A semi-structured, pre-tested questionnaire with responses analyzed with SPSS 11 software.

Result: Near universal agreement on indication exist on early corneal blood staining and sickle cell haemoglobinopathy. Differing views concern blackball, volume and duration of hyphaema and secondary hypertension-associated hyphaema. However, it appears surgery is embarked on earlier than other practitioners elsewhere may consider necessary.

Conclusion: Risk level for non-surgical management against risk and benefit of surgery should be evaluated for each individual before surgery.

Keywords: traumatic hyphaema, surgery, indications, consensus, divergence of opinion

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Introduction and Literature Review

Trauma has long been known to cause hyphaema.\(^1\) Perforation of the eyeball or a closed-globe hyphaema may result. Management of hyphaema in a non-perforated globe introduces challenges regarding the appropriate measures in preventing complications from occurring and treating them when they occur. These complications are re-bleeding, corneal blood staining, ocular hypertension/secondary glaucoma, and synaechia formation.\(^2,3\) Other considerations include treatment of concurrent anterior uveitis, and management in patients with sickle cell hemoglobinopathies.\(^2\) The range of management includes ancillary, medical and surgical procedures.\(^2\)

Surgical interventions in uncomplicated, closed-globe traumatic hyphaema are undertaken to evacuate blood from the anterior chamber. The goal is to prevent optic atrophy that may arise from secondary glaucoma and prevention of blood staining of the cornea, as well as treatment in a prompt manner to prevent progression if it is determined that either have commenced.\(^2,4\) Occurrence of optic atrophy in this condition is influenced by level and duration of IOP rise and susceptibility of the concerned patient’s optic nerve to resist damage.\(^3,5\) It is not possible to determine optic nerve resistance to mild, moderate pressure or even high pressure elevation, but it is known that tolerance is influenced negatively by the sickle hemoglobinopathy.\(^6\) Optic nerve diseases like glaucoma may preclude use of medications like steroid and cycloplegic agents commonly used in the management of hyphaema because they could themselves exacerbate intra-ocular pressure(IOP) rise.\(^7\) Occurrence of corneal blood staining is determined by a combination of volume and duration of hyphaema, level of IOP, and status of corneal endothelium.\(^3\) It is difficult to predict how fast corneal blood staining occurs in an individual by interaction of these four factors as it could occur in a few days in a patient with severe endothelial damage from causative trauma, even with moderate hyphaema with normal or minimally elevated IOP. Determination of what damage has been sustained by the corneal endothelium is not possible. Therefore, the problem of determining who is at risk of developing optic atrophy and corneal blood staining, how high the risk, and when these complications could occur results in a divergence of opinions and practices concerning surgery in closed-globe traumatic hyphaema. These decisions often do not have clear-cut guidelines based on a multi-centre controlled study.

Objectives of the Study

The current study is an attempt to discover what complications of traumatic closed-globe hyphaema ophthalmologists in Nigeria consider absolute indications for surgical intervention by means of anterior chamber paracentesis and irrigation.

A subsidiary attempt would be to evaluate the opinions and practices expressed, and if possible, suggest a guideline for paracentesis intervention based on areas of consensus and disagreement.

Methodology

A semi-structured pre-tested questionnaire was distributed to ophthalmologists that attended the afternoon scientific session on the 16th of September, 2008. The questionnaires were distributed at the beginning of the session and retrieved towards the end. Inquiries sought answers to complications and surgical management practices of the participants concerning traumatic hyphaema. Respondents were required to respond to questions as to what they considered absolute indications at which they completed paracentesis, and what they considered the procedure should be done. Responses were analyzed with SPSS 11 software.

Literature search was completed using Google search engine and HINARI access to literature for disadvantaged parties.

Results

One hundred and seven questionnaires were distributed, One hundred and one were retrieved, but 8 were discarded because filling was substantially incomplete, resulting in 93 used for analysis.

Respondents were from 42 eye care centers, 4 of which were private (9 ophthalmologists) and the remaining 38 public eye facilities (84 ophthalmologists). All regions and geographical zones of Nigeria were represented. The ophthalmologists who responded represent above 75% of eye care centers in Nigeria.

Responses are depicted in Tables 1–6.

Discussion

The trauma agent identified as the commonest cause of hyphaema among Nigerian patients in the current
Opinions on surgical intervention in traumatic hyphema

Surgical procedures and general indications

Surgical interventions used in closed-globe traumatic hyphema include paracentesis with or without irrigation, iridectomy, trabeculectomy, vitrectomy techniques, and limbal section for clot extraction. The challenge about preventive surgical management, as indicated earlier, is the difficulty of predicting cases that may develop complications so as not to offer unnecessary procedures to those who may not need it. Some complications, if allowed to occur before instituting necessary procedure, may result in prolonged visual disability such as corneal blood staining or permanent disability such as advanced optic nerve damage due to hyphema-induced glaucoma. Early surgery may result in a large proportion of patients undergoing the procedure. All but 7.5% of practitioners in current study indicated that surgery was infrequently required (Table 3) corroborating other views. Brandt and Hang noted in a review that surgery is required in only 5%–7.2% of traumatic hyphema patients and that the preferred procedure is paracentesis, occasionally accompanied by irrigation. Indications for paracentesis disclosed in the current study—full chamber hyphema corneal

Table 1. Showing trauma situations causing closed-globe hyphema as indicated by Nigerian ophthalmologists.

| Trauma situations           | Number indicating this as a common cause of hyphema | Percentage of respondents indicating this as a common cause of hyphema |
|-----------------------------|-----------------------------------------------------|-----------------------------------------------------------------------|
| Canning [whipping]          | 52                                                  | 55.9%                                                                 |
| Affray/assault              | 48                                                  | 51.6%                                                                 |
| Road traffic accident       | 22                                                  | 23.7%                                                                 |
| Domestic violence           | 21                                                  | 22.6%                                                                 |
| Others                      | 10                                                  | 10.8%                                                                 |

Note: Others in the table include accidental trauma like a fall [4], rubber band injury by children at play [3], and sports injury [3].

Table 2. Depiction of the practice of routine hospitalization for traumatic hyphema patients by Nigerian ophthalmologists.

| Practice                        | Occurrence  |
|---------------------------------|-------------|
| Hospitalization                 | 67 (72%)    |
| No hospitalization              | 19 (20.4%)  |
| Hospitalization and no hospitalization | 7 (7.5%) |

Table 3. Showing response of Nigerian ophthalmologists as to need for paracentesis in traumatic closed-globe hyphema.

| Necessity for paracentesis | Responses |
|----------------------------|-----------|
| Not frequent               | 86 (92%)  |
| Frequent                   | 7 (7.5%)  |

Note: Using Likert Scale test at critical region of 1.5, paracentesis is not a significantly frequent need in management of this condition.
staining, inadequate control of raised IOP, long duration of hyphaema and large blood clot in contact with endothelium (Table 4)—agree with the views and practices of practitioners in other locations,2,3,18 as does the need for early intervention in people with sickle cell haemoglobinopathy.16 Immediate surgery in uncomplicated traumatic hyphaema co-existing with chronic simple glaucoma or in cases of hyphaema online the only seeing eye of a patient is advocated by two practitioners and does not seem prudent. Surgery in these conditions is not an innocuous undertaking and is probably more risky than observation or medical treatment of complications.

In general the indications for surgery expressed by this group of Nigerian ophthalmologists agree with those reported by Amoni many years ago in Kaduna, Nigeria19 but absolute indications (when surgery must absolutely be undertaken) concerning degree of hyphaema, duration, and level of IOP or the interplay of the three find differing degrees of agreement among practitioners.

### Absolute indications for paracentesis

The situations indicated as absolute indications include hyphaema associated with raised IOP long standing hyphaema, presence of early corneal blood staining, presence of sickle cell haemoglobinopathy, and large clot in contact with corneal endothelium (black ball hyphaema) (Table 4). These indications are reasonable considering the natural history of these complications if not attended to promptly. However as depicted in Table 4, not all participants considered them absolute indications.

In sickle cell haemoglobinopathy, the optic nerve is poorly perfused and more susceptible to damage even in the presence of mild IOP rise; therefore evacuation of hyphaema is indicated earlier if there is secondary hypertension. A suggestion of an IOP of 35 mmHg and above for 24 hours has been offered,16 but IOP rise of 25 mmHg or above for at least two days is the view of the majority (50%) of those who indicated IOP as a factor in deciding absolute indication for surgical intervention. It is a more reasonable indication than 25 mmHg for 24 hours, or the 30 mmHg for five days suggested by 25% of the respondents.

Black ball hyphaema could result in corneal endothelial damage quickly resulting in corneal blood staining. Thus 89% of respondents feel the presence of this condition is an indication for immediate surgery, but 11% suggest a duration of 5 days before the procedure, and only if the size of the clot is not decreasing. Both opinions have their merit. Extraction of clot is a more extensive procedure since in this situation a limbal section is required rather than paracentesis used commonly in liquid hyphaema. Clot extraction is also more hazardous because of possibility of provoking secondary hemorrhage. Use of intra-cameral injection of urokinase, a fibrinolytic agent, to dissolve clot was advocated over three decades ago.20 It is not used by Nigerian ophthalmologists, probably due to its tendency to provoke secondary hemorrhage, and perhaps because of a lack of availability.

### Table 4. Showing conditions that were considered absolute indications for paracentesis in traumatic hyphaema by Nigerian ophthalmologist.

| Indication                                | Frequency |
|------------------------------------------|-----------|
| Uncontrolled intra-ocular pressure rise  | 54 (58.1%)|
| Long duration of hyphaema               | 31 (33.3%)|
| Corneal blood staining                   | 26 (28.0%)|
| Full chamber hyphaema                    | 27 (29%)  |
| ‘Black ball’ hyphaema/clots              | 18 (19.4%)|
| Sickle cell hemoglobinopathy             | 7 (7.5%)  |
| Only eye                                 | 1 (1.1%)  |

*Note: Some respondents indicated more than one situation they considered absolute indication.*

### Table 5. Showing indications for paracentesis in traumatic hyphaema associated with raised intra-ocular pressure.

| Number | Characteristics of hyphaema | IOP level                  | Duration | Level of hyphaema                     |
|--------|-----------------------------|----------------------------|----------|---------------------------------------|
| 43 (46.2%) | Non-reducing | Raised; level not specified | Not indicated | Not specified, but level non-reducing |
| 3 (3.2%) | Non-reducing | 50 mmHg and above           | 7 days   | Not indicated                         |
| 2 (2.2%) | Non-reducing | 55 mmHg and above           | 14 days  | Not indicated                         |
| 2 (2.2%) | Non-reducing | 35 mmHg                    | 3 days   | Not indicated                         |
| 2 (2.2%) | Non-reducing | 35 mmHg                    | 2 days   | Not indicated                         |
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Total hyphema not associated with raised IOP or sickle cell disease also have advocates. It is suggested as an absolute indication for immediate paracentesis by 30.1% (Table 4) of respondents. The rest do not indicate that they shared this opinion, needing other factors of duration or pressure rise. Sheppard et al opined that total hyphema evacuation is only necessary if it has lasted at least four days and is associated with a raised IOP of 50 mmHg and above. Read advocated surgery in total hyphema if it lasts five days and is associated with a consistent IOP level of 50 mmHg and above. Other investigators have found medical management effective and adequate for this condition for periods ranging from 4–24 days without increase in complications rate. Only a minority of 17.9% in the current study would entertain a duration of up to five days before surgery must absolutely be done and 10.7% do not feel surgery is needed unless there is in addition a raised IOP for periods varying from 24 hours to 14 days. There is a risk of corneal blood staining occurring, present at all levels of hyphaema, and at all IOP levels. It has been suggested this risk is more pronounced when total hyphema lasts above six days and is associated with IOP of above 25 mmHg. It thus appears that surgery is offered too early for total hyphema in Nigeria. Reasons for this probably include disruption of family life and cost implication of prolonged hospital admission for purposes of observation and fear of clot formation.

There is a universal agreement among respondents that non-total hyphema unassociated with raised IOP does not require immediate surgery; however, one practitioner would offer immediate surgery in those with diagnosed chronic simple glaucoma. We are unable to find any study, evaluative opinion, or practice in literature to appraise this suggestion.

Long duration of non-total hyphema unassociated with IOP rise is advocated as requiring paracentesis, with the aim being to prevent synaechia formation or corneal blood staining. Disagreements arise as to actual duration in days before surgery should be done. Duration of seven days was suggested by three ophthalmologists, and 14 days by four. The disinclination to immediate surgery in non-total hyphema not associated with raised IOP agrees with the suggestion by Sheppard et al that surgery gives inferior result in non-total hyphema and that surgery may be needed only in hyphema occupying above 50% of anterior chamber lasting a minimum of 8–9 days to prevent synaechia formation. Medical management is probably not inferior in preventing synaechia formation in this condition and has been found effective for hyphemas lasting up to 24 days, without increased complications rate. Surgical intervention is suggested as not indicated in this situation unless onset of early corneal blood staining supervenes.

All grades of hyphema associated with raised IOP finds the majority (58%) of respondents agreeing that long duration of inadequate control by medication is an indication for paracentesis (Table 4). Differing suggestions as to duration in days for hyphema or IOP level was offered. Indeed it is difficult from a scientific basis to precisely ascribe levels of risk and thus arrive at standard for assigning danger of permanent damage criteria if surgery is not done. Nine of the ophthalmologist who attempted stating criteria (Table 5) suggested such a wide range of conditions that are difficult to explain. A range of indications suggested in the current study varies from IOP level of 35 mmHg for two days to 55 mmHg for 14 days. Some investigators advise that an IOP level of above 25 mmHg lasting more than six days in hyphema above 75% is an indication for surgery. The different opinions and practices found in this study and suggested by other workers reflect the difficulty in predicting a universally applicable amount of risk associated with duration of various grades of hyphema coupled with different levels of intra-ocular pressure for causing optic atrophy and corneal blood staining. This remains an area that future studies must illuminate.

Critique of study
In interpreting responses in the current study the defects and advantages of an open ended questionnaire

| Number | Duration in days before surgery | Other considerations |
|--------|--------------------------------|---------------------|
| 16 (17.2%) | None                               | None               |
| 5 (5.4%)    | 5                                  | None               |
| 3 (3.2%)    | None                               | Raised IOP        |
| 1 (1.1%)    | 14                                 | None               |
| 1 (1.1%)    | 10 day                             | None               |
| 1 (1.1%)    | 7                                  | None               |
method become apparent in that specific items for consideration may not be considered by all respondents. On the other hand, important matters not considered by the investigator in rigidly structured questionnaires may be brought out. The question about what was considered absolute indication for paracentesis was deliberately left unstructured, resulting in instructive, diverse data that is sometimes difficult to categorize. The chaos that is considered absolute indications by different people is revealed by this method of enquiry. Specific issues if desired could be further explored in subsequent studies.

Simple random sampling of questionnaire distribution was found impractical in this study. However, responding practitioners represented upwards of 75% of eye care centers in the country, from different regions of the country, and representing, we expect, all the philosophies and practices with regards to this issue. Thus we might assert that responses, even if in specific percentage terms, are not considered exact and must be considered as broadly representative.

Other sources of bias that may exist in studies of past events include recall bias, memory failures and selective/differential memories. Recall bias is considered unique to case/control studies. Memory failure and differential and selective memory if it occurs in the current study would be minimal as the condition under investigation is a day to day occurring condition; its effect we believe would be inconsequential.

Conclusion and Recommendations
Opinions and practices of Nigerian ophthalmologists concerning this condition are diverse indeed. Blood staining of cornea, sickle haemoglobinopathy and large blood clot in contact with the cornea appeared to be absolute indications. Total or non-total hyphaemas associated with raised intra-ocular pressure lasting for many days and demonstrating inadequate response to pressure lowering drugs were considered candidates for paracentesis and irrigation. More specific values in terms of level of hyphaema its duration and how fast it is reducing and associated intra-ocular pressure rise and its level of reduction on medical therapy were issues that did not evoke any agreement.

In a clinical condition such as this, with diverse opinions and practices and in which no multi-center case-control study exists as a guide, the basis for any recommendation may be questioned. It is not possible to generate a general treatment guide for this condition based on the opinions and practices of the Nigerian ophthalmologists that this study revealed. The only reasonable recommendation is to consider each case on its merit; no recommendation can possibly be of universal application in this condition.

Author Contributions
MCO conceived and designed the experiments. MCO analysed the data. MCO Wrote the first draft of the manuscript. LOO and MCO contributed to the writing of the manuscript. MCO and LOO agree with manuscript results and conclusions. MCO and LOO jointly developed the structure and arguments for the paper. MCO and LOO made critical revisions and approved final version. All authors reviewed and approved of the final manuscript.

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Questionnaire
Common practices in traumatic hyphema

1. Status:
   [a] consultant, [b] senior registrar, [c] registrar, [d] senior house officer

2. Institution: .................................................................

3. What is the most common cause of hyphema in your practice?:
   [a] trauma, [b] rubeosis iridis, [c] tumour, [d] others [specify] ...........

4. What are the common causes of traumatic hyphaema in your experience?:
   [a] affray and assaults, [b] caning of children by teachers or parents, [c] road traffic accident, [d] domestic violence, [e] others [specify] .........................

5. What are the common early complications you encounter in traumatic hyphaema?:
   [a] anterior uveitis, [b] ocular hypertension/glaucoma, [c] corneal blood staining, [d] re-bleeding

6. What drugs do you usually use in traumatic hyphaema?:
   [a] corticosteroid eye-drops/ointment, [b] carbon anhydrase inhibitor tablets, [c] atropine or other cycloplegic eye-drops, [d] pilocarpine eye-drop, [e] vitamin-c tablet, [f] calcium compounds, [g] amino-caproic acid, [h] others; please specify ............

7. Which are your usual practices in traumatic hyphaema?:
   [a] hospital admission and bed rest in head-up position, [b] bed rest at home, [c] padding of affected eye, [d] padding of both eyes, [e] no bed rest, but restricted activity, [f] others; please specify ............

8. Do you find it necessary to do paracentesis in traumatic hyphaema?:
   [a] frequently, [c] not often

9. What do you consider absolute indications for paracentesis in traumatic hyphema?: .........................