

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

Ophthalmology and Eye Diseases 2012:4 71–78

doi: [10.4137/OED.S9411](https://doi.org/10.4137/OED.S9411)

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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 synechia 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 haemoglobinopathy.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 hyphema.

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

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

Trauma situations	Number indicating this as a common cause of hyphaema	Percentage of respondents indicating this as a common cause of hyphaema
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].

study is corporal punishment by whipping (Table 1). Whipping as a cause of this condition in Nigeria has been much reported by investigators.^{8–11} This does not seem to be the case in other locations.^{1–5} However, other etiologic situations identified are the same. Complications, their rates, and the need for surgery have not been identified as being different in hyphaema caused by whipping when compared to other cases. Complications of traumatic hyphaema found are the same as that noted by other investigators and include re-bleeding, corneal blood staining, ocular hypertension/secondary glaucoma, and synechia formation.^{2,3,8}

The majority of respondents in the present study (Table 2) hospitalize all patients, no doubt to monitor for complications that may need medical or surgical intervention, and treat them in a prompt manner if they occur. This concurs with the reported practice of other ophthalmologists in other parts of the world.^{4,5,12,13} However, some Nigerian ophthalmologists do not hospitalize routinely, also in accordance with practices and recommendations by other practitioners.^{1,14,15} Reports suggest non hospitalization does not increase the rate of complication nor the requirement for surgical intervention.¹⁵ Nevertheless, as patients with hyphaema need to be monitored daily and because in most parts of Nigeria patients frequently travel long distances for treatment and may have difficulty seeing the attending ophthalmologists

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

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

on a daily basis daily for review, out-patient management may be impractical. Admission to hospital is the better practice under this circumstance.

Surgical procedures and general indications

Surgical interventions used in closed-globe traumatic hyphaema include paracentesis with or without irrigation, iridectomy, trabeculectomy, vitrectomy techniques, and limbal section for clot extraction.¹⁶ 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 hyphaema-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.^{4,5} Brandt and Hang¹⁷ noted in a review that surgery is required in only 5%–7.2% of traumatic hyphaema patients and that the preferred procedure is paracentesis, occasionally accompanied by irrigation. Indications for paracentesis disclosed in the current study—full chamber hyphaema corneal

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

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.



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.

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 factors 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 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



Table 6. Showing indications for paracentesis in full-chamber traumatic hyphaema as disclosed by Nigerian ophthalmologists.

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

Total hyphaema 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 al¹⁶ opined that total hyphaema 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 hyphaema if it lasts five days and is associated with a consistent IOP level of 50 mmHg and above.¹⁸ Other investigators have found medical management effective and adequate for this condition for periods ranging from 4–24 days without increase in complications rate.^{3,5} 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 hyphaema lasts above six days and is associated with IOP of above 25 mmHg.¹⁶ It thus appears that surgery is offered too early for total hyphaema 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 hyphaema 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 hyphaema unassociated with IOP rise is advocated as requiring paracentesis, with the aim being to prevent synechia 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 hyphaema not associated with raised IOP agrees with the suggestion by Sheppard et al¹⁶ that surgery gives inferior result in non-total hyphaema and that surgery may be needed only in hyphaema occupying above 50% of anterior chamber lasting a minimum of 8–9 days to prevent synechia formation.¹⁶ Medical management is probably not inferior in preventing synechia formation in this condition and has been found effective for hyphaemas lasting up to 24 days, without increased complications rate.⁵ Surgical intervention is suggested as not indicated in this situation unless onset of early corneal blood staining supervenes.

All grades of hyphaema 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 hyphaema 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 hyphaema above 75% is an indication for surgery.¹⁶ 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 hyphaema 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



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.

Funding

Author(s) disclose no funding sources.

Competing Interests

Author(s) disclose no potential conflicts of interest.

Disclosures and Ethics

As a requirement of publication author(s) have provided to the publisher signed confirmation of compliance with legal and ethical obligations including but not limited to the following: authorship and contributorship, conflicts of interest, privacy and confidentiality and (where applicable) protection of human and animal research subjects. The authors have read and confirmed their agreement with the ICMJE authorship and conflict of interest criteria. The authors have also confirmed that this article is unique and not under consideration or published in any other publication, and that they have permission from rights holders to reproduce any copyrighted material. Any disclosures are made in this section. The external blind peer reviewers report no conflicts of interest.

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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?: