Nd YAG LASER treatment for leukemic childhood blindness

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(Received 7 / 7 /2014 , Accepted 22 / 7/ 2015)

الخلاصة:
الغرض من الدراسة:-
هو دراسة دور العلاج بالليزر نوع (Nd YAG) في علاج حالات النزف ما قبل الشائبة الصفراء في الاطفال المصابين بمرض اللوكيميا.
طريقة العمل:-
نوع الدراسة (Prospective study) تم اجراء الدراسة في شعبة العيون في مستشفى الحلة التعليمي ، تم علاج احدى عشر عيناً تعود الى ثمانية اطفال (ثلاث -بنات وخمسة اولاد) اعمارهم تتراوح بين 7-14 سنة وهم يعانون من عقابيل مرض اللوكيميا في الشبكية (نزف ما قبل الشائبة الصفراء) حيث تم اخذ الموافقة من ذوي المرضى بعد شرح تفاصيل العملية لهم. تم تخدير العين تخديراً موضعياً بواسطة قطرة التخدير (Lidocained) وتم توسيع حدقة العين بواسطة قطرة التوسيع (Mydriacil) وتم استخدام العدسة الثلاثية مع تسليط الليزر (Nd YAG) وبقوة 5 ملي جول وزيادة 1 ملي جول عند عدم حصول الاستجابة على ان لا تزيد القوة عن 11 ملي جول وان لا تزيد عدد الضربات عن 10 في جلسة واحدة ثم تم متابعة المريض بعد اسبوع ثم بعد ستة اسابيع ثم بعد ثلاثة اشهر.
النتائج:-
- تم حصول بزل للنزف في 9 عيون من اصل 11 عين بنهاية فترة المتابعة والبالغة ثلاثة اشهر.
- معدل القوة المستخدمة في الليزر 6.5 ملي جول
- بعد اسبوع واحد مدى التحسن في حدة البصر كان يتراوح بين حركة اليد 6/6 بمعدل 18/6
- بعد ستة اسابيع مدى التحسن في حدة البصر كان يتراوح بين حركة اليد 6/6 بمعدل 9/6
- لم يكن هناك فرق ملحوظ في تحسن حدة البصر بعد ثلاثة اشهر من المتابعة عما حصل بعد ستة اسابيع
- واحد من المرضى الذي كان يعاني من مرض اللوكيميا نوع اللمفوبلاستك كان لديه نزف متخثر ولم يتم بزل النزف الى السائل الزجاجي
- مريض اخر يعاني من مرض اللوكيميا نوع المايلويد حصل عنده نزف متكرر نتيجة تدهور حالته المرضية

الاستنتاج:-
من النتائج المستوحاة لهذا البحث ان استخدام الليزر نوع (Nd YAG) للمرضى المصابين بنزف ما قبل الشائبة الصفراء نتيجة عقابيل مرض اللوكيميا هي طريقة امنه وفعالة مقارنة بعملية قص السائل الزجاجي التي تعتبر من العمليات فوق الكبرى وتحتاج الى التخدير العام لفترة لا تقل عن ثلاث ساعات وهو امر ليس بالسهل والحالة الصحية العامة لمرضى اللوكيميا ولاسيما في حال الاختيار المناسب للمرضى وخاصة الذين يعانون من نزف ما قبل الشائبة الصفراء في كلتا العينين. ومن هذا نستنتج يمكن اعتبار استخدام (Nd YAG) ليزر روتينياً في علاج النزف ما قبل الصفراء للاطفال المصابين بمرض اللوكيميا

Abstract:
Aim of the study: is to study the rule of laser therapy by the (Nd-YAG) laser in the treatment of premacular haemorrhage in leukemic children
Method:
It is a prospective study was taken in department of ophthalmology in al hilla teaching hospital .eleven eyes of eight children 3 girls and 5 boys age between 7-14 years old and they have premacular haemorrhage due to leukaemia .family permission was taken after explaining to the family the surgical procedure .topical anesthesia by lidocaine and pupil dilatation by mydriacil and the Goldman 3 mirror and Nd –YAG laser was delivered the power was 5 mj and increased by 1 mj when the desired response not gained and the power should not exceed 11mj and the number of shoots should not exceed 10 per section and the pt was followed after 1 week then after 6 weeks then after 3 months.
Results:
Drainage of the premacular hemorrhage into the vitreous happened in 9 eyes of 11eyes after the end of the follow up period which is 3 months

The mean force used was 6.5 mj
After 1 week the improvement in VA was between hand movement and 6/6 and the mean was 6/18
After 6 weeks the improvement in VA was between hand movement and 6/6 and the mean was 6/9
There is no big difference in improvement in VA after 3 months to that after 6 weeks
One pt who had lymphoblastic leukemia had clotted hemorrhage that could not be drained into the vitreous
And another pt who had myeloid leukemia had re-hemorrhage as a result of deterioration in his illness
Conclusion:
From the result of this study we can see that the use of Nd-YAG laser in the treatment of leukemic pts with premacular hemorrhage is safe and effective in comparing with parsplana vitrectomy under GA specially when we use good selection of pt especially those with bilateral premacular hemorrhage and we can consider the Nd-YAG laser as a routine therapy for the leukemic children with premacular hemorrhage.

Introduction:
Ocular manifestation in leukemia is varied. Eye is involved either directly or indirectly from thrombocytopenia, anaemia, hyperviscosity or chemotherapeutic agents(1). The retina is the tissue most frequently involved in leukemic complication(1)(3). Haemorrhages in the retina are the most striking feature in leukemia. These tend to occur most commonly in posterior pole(4)(2). Premacular subhyaloid haemorrhage is one of the important causes of poor vision in leukemic children (5). The haemorrhage can cause profound visual loss and if it is bilateral it can hamper the daily routine activities (6).
Although spontaneous resolution of haemorrhage occurs it may take several months.In longstanding cases the macula may be damaged by pigmentary macular changes or formation of epiretinal membranes or iron and haemoglobin induced toxicity to the macula(7). Various modalities of treatment for premacular subhyaloid haemorrhage are available including pars plana vitrectomy and pneumatic displacement by intravitreal use of gas and tissue plasminogen activator(8). Nd yag posterior hyaloidotomy is safe and easy alternative for releasing the entrapped subhyaloid blood into the vitreous and by this way absorption of blood cells in facilitated. The need for unnecessary general anaesthesia in already compromised leukemic children and vitrectomy and its complications are avoided.

Materials and Methods:
This interventional study was carried out in eleven eyes of 8 patients with Premacular subhyaloid haemorrhage. Only those children cooperative for Nd yag laser posterior hyaloidotomy and children with premacular subhyaloid haemorrhage without significant vitreous opacities precluding the use Of Nd Yag laser were included. Best corrected visual acuity, detail slit lamp microscope evaluation, intraocular pressure and fundus photography carried out before and after treatment and on subsequent visits. The procedure was explained and consent was taken from the parents. Mydriasis was achieved by tropicamide 0.5% and topical anaesthesia with lignocaine 4% eye drops. Nd yag laser emitting single burst was delivered using a Goldman triple mirror. The helium: neon beam was focused on the inferior point on the subhyaloid haemorrhage which was far from the fovea and away from the major retinal vessels. Laser exposures were started from energies of 5mJ and increased one mJ each step until perforation becomes visible at the surface of haemorrhage and the blood flow into vitreous cavity were evident. The energy per exposure

did not exceed 11mJ and the cases that did not drain after ten bursts were not given further exposures. Patients were followed up at one week, six weeks and at the end of three months post operative periods. The main outcome measures included releasing the entrapped blood into the vitreous and its quick resorption postoperative improvement in visual acuity and postoperative comp;ications which were recorded and analysed

Results:

The success of laser treatment was defined by clearing of premacular haemorrhage by 3 months. Eleven eyes of 8 patients with acute childhood leukemia were enrolled in this interventional series. These included 3 females and 5 males, with an average age of 11.5 ± 2.82 years (range: 7 to 14 years). Four (50%) had acute lymphoid leukemia and four (50%) had acute myeloid leukemia. Three patients (37.5%) had bilateral premacular subhyaloid haemorrhage. The mean pretreatment haemorrhage as judged by fundus photography was 7.18 disc areas. Drainage of premacular subhyaloid haemorrhage with Nd: YAG posterior hyaloidotomy at the end of 3 month occurred in nine out of eleven eyes treated. Preoperative visual acuity ranged from hand motion to 2/60.

The mean power required to perform posterior hyaloidotomy was 6.55mJ and the mean number of laser energies required to perform posterior hyaloidotomy was 3.45. After 1 week, visual acuity ranged from hand motion to 6/6 (median, 6/18), six weeks after hyaloidotomy visual acuity ranged from hand motion to 6/6 (median, 6/9), and was not significantly different from visualacuity after 3 months. However at 3 months follow up, one patient with acute myeloid leukemia had rebleed resulting in deterioration of pre-existing vision and one patient with acute lymphoblastic leukemia had dense clotted premacular haemorrhage that did not drain into vitreous. None of the patients had persisting vitreous haemorrhage.

Overall visual improvement was equal in both acute lymphoblastic and acute myeloid leukemia. Table 1 and Figure 1 and 2, summarises patients' characteristics and postoperative results. No special complication including increase in intraocular pressure, retinal and choroidal aemorrhage, macular hole, retinal breaks, epiretinal membrane, or tractional retinal detachment occurred during the follow up period over 3 months.

Table 1: (Nd yag laser Hyaloidotomy for Premacular Subhyaloid Haemorrhage in Childhood Acute Leukemia: patients characteristics)

[Visual Acuity]

Patient	Age/ Sex	Diagnosis	Eye	Size of Haem	Before Treatment	After 1 wee	After 6 week	After 3 month	Number of Las	Energy per plasma (mi
1	14	A	R	5	HM	6/	6	6/	2	5,6
			L	8	HM	6/	6	6/	4	5,6,7,
2	7/	A	R	10	HM	6	6	6/	4	5,6,7,
3	14/ M	A LL	R E	10 D	HM	H M	H M	1/ 60	7	5,6,7,8, 9,1
			L	6	HM	6	6	6/	3	5,6,
4	13/	A	L	8	*1/60*	6/	6	6/	4	5,6,7,
5	14/	A	L	5	1/60	6/	6	6/	2	5,6
6	10	A	R	7	HM	6/	6/	6/	3	5,6,
			L	3	1/60	6/	6/	6/	2	5,6,
7	12	A	R	10	HM	6/	6/	1/	5	5,6,7,
8	8/	A	R	7	2/60	6/	6	6/	2	5,6

M, indicates Male; F, Female; AML, Acute Myeloid Leukemia; ALL, Acute Lymphoid Leukemia; DA, Disc Area;HM, Hand Motion

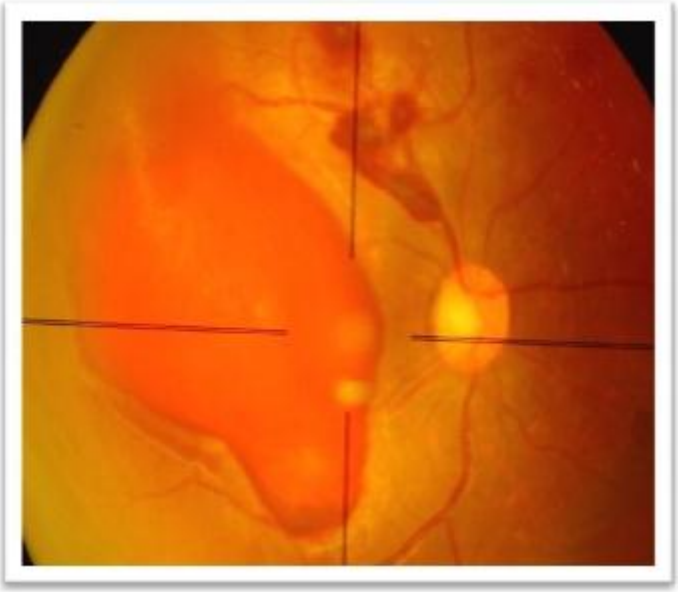

Fig 1a. Fundus picture of Subhyaloid haemorrhage in 7 yrs old Male with ALL.

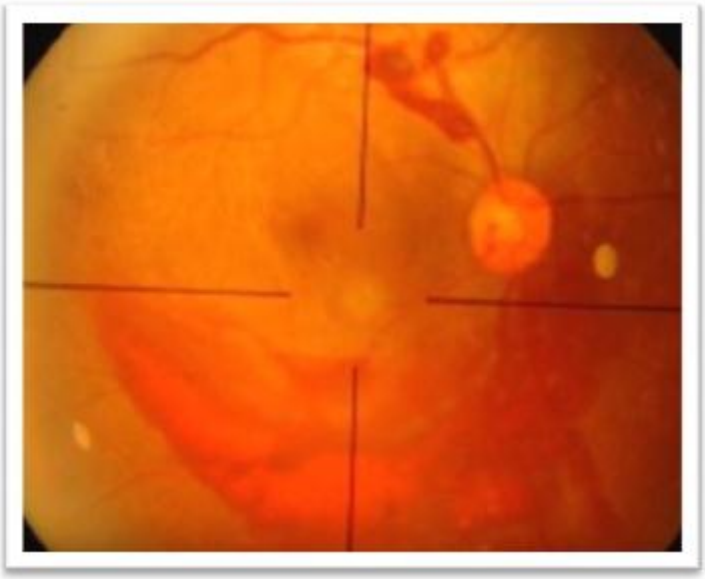

Fig 1b. Fundus picture as described in fig 1a one hour after Nd yag laser hyaloidotomy. Note the premacular blood draining into vitreous cavity.

Fig 2a. Fundus picture of Premacular Subhyaloid Haemorrhage Left eye in 12 years child
with AML.

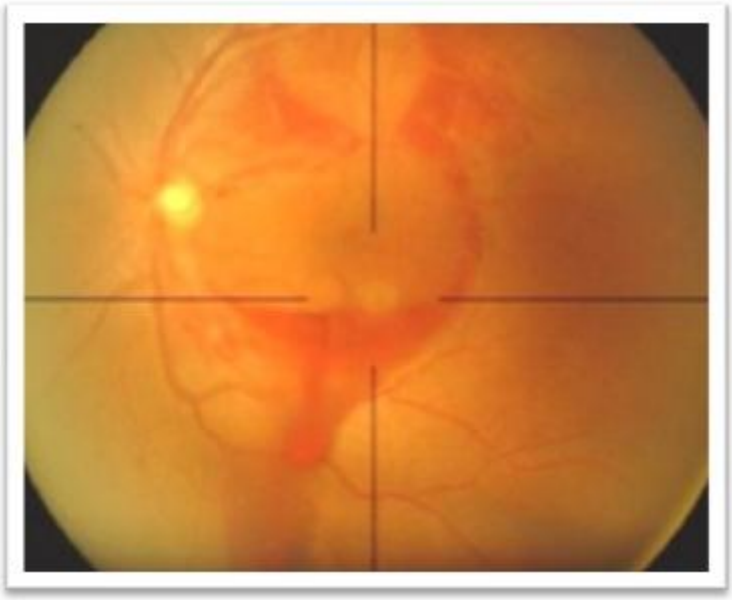

Fig 2b. Fundus picture as described in fig 2a after Nd yag laser hyaloidotomy. Note the premacular haemorrhage draining into vitreous through inferior hyaloidotomy.

Discussion :

Leukemias are a group of heterogeneous neoplastic disorders of white blood cells (5).

Leukemia can affect virtually any organ or system of the body. Knowledge of the ocular manifestations of leukemia is important not only because of the frequency with which changes are seen, but also reflects the disease state of the body (9). They may be the initial mode of presentation or first sign of relapse of systemic illness; indeed, before the use of bone marrow biopsy, the ophthalmologist was often called on to assist with the diagnosis of Leukemias (10). Eye can be involved either directly or indirectly. Indirect involvements are secondary to haematological abnormalities of leukemia such as anaemia, thrombocytopenia, hyperviscosity and immunosuppression.

These can manifest as retinal or vitreous haemorrhage, infections and vascular occlusions(11).

Estimates of the prevalence of ocular involvement in are varied and ranges from 9 to 90%(12)(13).

The retina is the tissue most frequently involved in leukemic complication. It is estimated that up to 69% of all patients with leukemia show fundus changes at some point in the course of their disease (14). Retinal haemorrhage can occur in all levels of the retina, usually in the posterior pole, and may extend into the subretinal space or vitreous (15). Leukemic retinopathy was first described by Liebrih in 1860 and since that time, virtually all ocular structures have been found to become involved. Subhyaloid premacular haemorrhage usually causes profound visual loss in one or both eyes of atient with childhood acute leukemia (2). Spontaneous clearing of premacular haemorrhage usually occurs but usually takes several months and might cause permanent visual loss due to pigmentary macular changes or growth of epiretinal membrane and toxic injury to the retina due to prolonged contact with haemoglobin and iron. Pars plana vitrectom], pneumatic displacement of haemorrhage by intravitreal injection of gas and tissue plasminogen activator, and posterior hyaloidotomy with Nd yag are various treatment options available for premacular subhyaloid haemorrhage.

Consequently, the obscured macular area is cleared and resorption of blood cells from the vitreous is facilitated. Early intervention seems crucial to prevent permanent visua loss by pigmentary macular changes. Vitrectomy in children is an alternative treatment for premacular subhyaloid haemorrhage but general anaesthesia in already compromised child is risky and may be associated with numerous complications; cataract, intraoperative retinal breaks and Proliferative vitreoretinopathy .Perforating the posterior hyaloid face or internal limiting membrane by use of pulsed Nd yag has been described as a practical substitution to vitrectomy. The only drawback particularly in children is lack of

cooperation. In comparison to vitrectomy the laser procedure is the ambulatory and painless procedure. It will not affect the outcome of deferred vitrectomy. In this study, we performed posterior Nd yag hyaloidotomy in 11 eyes of 8 children with premacular subhyaloid haemorrhage. The haemorrhage started draining immediately after completion of hyaloidotomy (fig. 1.a, 1.b and fig. 2.a, 2.b) In 10 eyes, the trapped blood was released into the vitreous and the visual acuity was better than 6/36 (Snellen chart) after 7 days follow up and 1 eye had clotted blood that did not drain. After 3 month follow the haemorrhage was completely reabsorbed and the visual acuity was better than 6/12 (Snellen Chart) in 9 eyes. The eye with clotted blood did not drain even after 3 month and was subjected for vitrectomy. One eye with good vision at first week and three week follow up had poor visual acuity at 3 month follow up due to rebleed.

Conclusion:

Considering the results of this study, we may conclude that Nd yag hyaloidotomy is a simple outpatient procedure, relatively safe as compared to vitrectomy under general anaesthesia particularly in children with leukemia. It results in rapid visual rehabilitation in selected cases. The rapid resolution is particularly important for children with poor vision in fellow eye, children with bilateral premacular subhyaloid haemorrhage.

The risks and benefits have to be weighted in randomized clinical trials to establish Nd yag hyaloidotomy treatment as a routine procedure in leukemic children.

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