

## Barrage Laser Photocoagulation Procedure in Retinal Diseases

Putra Tridiyoga, Anom Indraswara, Putu Budhiastra, Ari Andayani

Departement of Ophthalmology, Medical Faculty Udayana University

Denpasar

### Introduction and Objective

Barrage laser photocoagulation is a rapid and continuous laser procedure for peripheral retina disorders. The procedure's objective is to strengthen the contact between retina and retinal pigment layer so retinal detachment could be prevented. Rhegmatogenous Retinal detachment mostly caused by high myopia and peripheral lattice degeneration. The aim of this study is to report characteristic barrage laser procedure.

### Methods:

Retrospective study of barrage laser photocoagulation procedure. The data was gathered from medical record from March 2017 to February 2018 at Sanglah and Balimed Hospital Denpasar.

### Result:

From 22 eyes of procedure barrage laser photocoagulation, 12 eyes (54,5%) were male and 10 eyes (45,5%) were female. Mean age is 45,6 years old. The disorders consist of high myopia with retinal thinning for 9 (40,09%) cases, lattice degeneration for 8 (36,3%) cases, break of peripheral retina for 3 (13,6%) cases and atopic micro hole of peripheral retina for 2 (9,09 %) cases. All patients felt blurry vision post-laser procedure for about one hour. About 6 eyes patient were indicated for barrage laser because of retinal detachment history on the contralateral eye. No scotoma or retinal detachment was found in one month evaluation. About 7 eyes patient were going to undergone clear lens extraction with Intra Ocular Lens.

### Conclusion:

Barrage laser photocoagulation procedure is beneficial for prevention and treatment of peripheral retinal disorders.

### Introduction

The Barrage Laser is an Argon Laser treatment that performed to strengthen weakened areas of the retina. During routine eye check-ups, if the retina is suspected to be weak, it is treated to strengthen it so that serious eye problems such as retinal detachment can be avoided. Barrage laser treatment is also performed to seal retinal tears<sup>1</sup>.

Barrage laser is at times done prophylactically around a hole or tear associated with lattice degeneration in an eye at risk of developing a retinal detachment. Laser photocoagulation has been shown to reduced risks of retinal detachment in symptomatic lattice degeneration. There are documented cases wherein retina detached from area which were otherwise healthy despite being treated previously with laser<sup>2</sup>.

Although prophylactic laser treatment may not convincingly prevent subsequent retinal detachment, some authors believe that laser demarcation may limit the extension of future detachments and help preserve the macula. All areas of lattice and retinal breaks should be meticulously sought after and barricaded with laser or cryotherapy. Lattice degeneration is a common, atrophic disease of the peripheral retina characterized by oval or linear patches of retinal thinning. The prevalence peaks by the second decade and is believed to be minimally progressive but may be complicated by retinal breaks and retinal detachment<sup>3</sup>.

Lattice degeneration, a vitreoretinal interface abnormality, is found in 6%- 10% of the general population and is bilateral in one third to half of affected patients. It occurs more commonly in myopia eyes, a familial predilection is present. Lattice degeneration progresses to retinal detachment either by means of a tractional tear at the lateral or posterior margin of the lattice lesion. The latter patients tend to be young, myopic, and asymptomatic until fixation is involved<sup>4</sup>.

The aim of this study is to report characteristic barrage laser photocoagulation procedure.

## Methods

Retrospective study of 22 eyes (18 patients) undergone barrage laser photocoagulation procedure. The data was gathered from medical record from March 2016 to February 2018 at Sanglah and Balimed Hospital Denpasar.

Patient sampling include patients between 30 to 70 years old, laser photocoagulation with periphery disorders of retina with clear media, agreed to undergo laser procedure, signed the informed concern and

be able to follow up until one month long. Patients that excluded from this study were if breaks or disorders found not at periphery retina, patients with retinal detachment minimally or more, detach of peripheral retina and loss of follow up.

Procedure Barrage laser photocoagulation:

1. Mark the patient's eye ( right or left )
2. Instill two drops of midriatyl 1 % eye drop.
3. Wait for about 20 minutes.
4. Instill two drops of Pantocain 2 % eye drop.
5. Prepare the Mainster lens and apply Oculenta eye ointment at patient side of lens.
6. Put the Mainster lens on to cornea of patient's eye.
7. Set the Laser panel to 200 mmv to 240 mmv in power, 100 of spot size, interval time is 200, and burn time approximately to 120.
8. Turn on the Power laser.
9. Shoot the laser to the target of affected retina.
10. Note of numbers of burn laser.
11. Prescribe the steroid eye drop for the patient.
12. Follow up the patient at 1<sup>st</sup> day, 1<sup>st</sup> week and 1<sup>st</sup> month after the laser treatment.

## Result

From 22 eyes (18 patients) whom underwent barrage laser photocoagulation procedure, 12 eyes (54,5 %) were male and 10 eyes (45,5 %) were female. Mean age is 45,6 years old. The retinal disorders consist of retinal peripheral thinning due to myopia that on 9 eyes ( 40,09 %), than lattice degeneration due to myopia that on 8 eyes (36,3 %), , than retinal peripheral break that on 3 eyes (13,6 %).

All patients felt moderate pain during laser procedure and blurry vision after laser procedure for about one hour but recovered.

Table1 : Age distribution

Age (year)	Number (eye)	%
20 – 30	6	27,27
31 – 40	2	09,09
41 – 50	7	31,81
51 – 60	2	09,09
61 – 70	5	22,72
Total	22	100

Table 1 showed that from 22 eyes given barrage laser photocoagulation, most of them were between 41-50 years old which were 7 eyes (31,81 %), than 20-30 years old which were 6 eyes (27,27 %), with mean age of 44,41 years old.

Table 2: Sex distribution

Sex	Number (eye)	%
Male	12	54,5
Female	10	45,5
Total	22	100

Table 2 showed that from 22 eyes whom given barrage laser photocoagulation most of them were male that were 12 eyes (54,5%) and female were 10 eyes (45,5%).

Table 3: Diagnosis for barrage laser procedure

Diagnosis (eye)	Number	%
Retinal pr thinning due to myopia	9	40,09
Lattice degeneration to myopia	8	36,3
Retinal peripheral break	3	13,6
Atopic hole peripheral retina	2	9,09

Table 3 showed that from 22 eyes given barrage laser photocoagulation diagnosis mostly were diagnosed with retinal peripheral thinning due to myopia that on 9 eyes ( 40,09 %), than lattice degeneration due to myopia that on 8 eyes (36,3 %), , than retinal peripheral break that on 3 eyes (13,6 %), barrage laser underwent at 7 myopic eyes patient to continue for clear lens extraction (phacoemulsification) with intra ocular lens and capsular tension ring (CTR), 6 eyes patient with history contralateral eye retinal detachment.

#### Discussion

Lattice degeneration is a disease of the peripheral retina in which become atrophic in the lattice pattern and may develop tears, breaks, or holes, which may further progress to retinal detachment. It is an important cause retinal detachment in young myopic individuals. The cause is unknown, but pathology reveals inadequate blood flow resulting in ischemia and fibrosis<sup>2</sup>.

Shukla D et all, undergone barrage laser photocoagulation in containing macula-sparing clinically asymptomatic retinal detachment between 12 to 58 years old (average 26 years old), from 17 patients; 8 male and 9 female patients. The conclusion is barrage photocoagulation may have a place in management of a clinically symptomatic detachments, as an effective and less morbid alternative to scleral buckling<sup>5</sup>. In this study, barrage laser undergone at 22 eyes which were 13 eyes (59,09%) male and 9 eyes (40,91%)female,

mostly were between 41-50 years old in 7 patients (31,81 %), than 20-30 years old in 6 patients (27,27 %).

Lattice degeneration is seen in elongated well demarcated white or pigmented patches lying circumferentially or radially form around the peripheral retina. It is the cause of about 20-30% of all retinal detachments. Detachment of the retina is caused by a tear that begins from posterior to or at the end of the lattice degeneration or by the edge of atopic holes in lattice itself<sup>8</sup>. Lattice degeneration, a vitreoretinal interface abnormality, found in 6%- 10% of the general population and is bilateral in one third to half of affected patients. It occurs more commonly in myopic eyes, a familial predilection in present. Lattice degeneration progresses to retinal detachment either by means of a tractional tear at the lateral or posterior margin of the lattice lesion. The latter patients tend to be young, myopic, and asymptomatic until fixation is involved<sup>4</sup>. A retrospective study found that the risk of retinal detachment in the fellow eye of the patients with phakic lattice retinal detachments were reduced over 7 years of follow-up from 5,1%in treated eyes to 1,8 % in those with full prophylactic laser treatment of lattice degeneration<sup>4</sup>. Abnormal vitreoretinal adhesions are present in many eyes with RRD. Lattice degeneration of the retina is a common condition characterized by both retinal thinning and abnormal vitreoretinal adhesions, increasing the risk for one or more retinal tears<sup>6</sup>.

Lattice degeneration complicated by tractional tear as the result of acute, symptomatic posterior vitreous detachment represents a high-risk situation for future retinal detachment and is an urgent indication for laser retinophexy. The presence of lattice lesions in fellow eyes of patients who have sustained retinal detachment in the first eye may be treated prophylactically. Moreover, laser scars may increase vitreoretinal adhesion and increase the risk of future retinal tears. Therefore, this indication is controversial. Although

prophylactic laser treatment may not convincingly prevent subsequent retinal detachment, some author believe that laser demarcation may limit the extent of future detachments and help preserve the macula<sup>7</sup>. An important developmental lesion related to retinal breaks and posterior vitreous detachments is lattice degeneration, the margins of which have firm vitreoretinal adhesions, Traction on these typically produce retinal tears at the posterior or lateral edges, While lattice degeneration is seen in only 6 % to 8 % of the general population, up to of all rhegmatogenous retinal detachment occur in these eyes<sup>8</sup>.

Myopia is a major cause of retinal weakness. The retina is the light receptive layer at the back of the eye. With severe myopia, the retina becomes thinner and weaker causing Lattice degeneration (oval or linear patches of retinal thinning) or retinal holes / tears. The Barrage Laser is an Argon Laser treatment which is performed to strengthen weakened areas of the retina. During routine eye check-ups, if the retina is suspected to be weak, it is treated to strengthen it so that serious eye problems such as retinal detachment can be avoided. Barrage laser treatment is also performed to seal retinal tears<sup>1</sup>. Shukla D et al, undergone barrage laser photocoagulation in containing macula-sparing clinically asymptomatic retinal detachment between 12 to 58 years old (average 26 years old), from 17 patients; 8 male and 9 female patients. The conclusion is barrage photocoagulation may have a place in management of a clinical symptomatic detachments as an effective and less morbid alternative to scleral buckling<sup>5</sup>. Myopia with refractive error greater than 8 diopters accounts for 10% of all retinal detachments<sup>8</sup>. More than 50% non-traumatic rhegmatogenous retinal detachment suffering at myopia eyes. Increased axial length of the eye increased rhegmatogenous retinal detachment proportionally, about four time than normal eye<sup>9</sup>. In our study, barrage laser that

underwent at Lattice degeneration due to myopia at 8 patients (36,36%),retinal peripheral thinning due to myopia at 7 patients (31,81%). and no report retinal detachment during evaluation.

Moustafa K.N. has done prophylactic laser barrage treatment before phacoemulsification in thirty eyes of 20 patients with high myopia patients, Prophylactic laser barrage treatment significantly reduces the incidence of retinal detachment after phacoemulsification in high myopia. It is well known that individual with high myopia have an increased risk of retinal complication such as peripheral retinal degeneration, retinal detachment, posterior staphyloma, chorioretinal atrophy, retinal pigment epithelial atrophy and macular hemorrhage. Among the deferent types of peripheral degeneration, lattice degeneration is the most important peripheral retinal degeneration that can predispose one to rhegmatogenous retinal detachment<sup>10</sup>. In our study barrage laser underwent at 7 myopic patients before clear lens extraction with intra ocular lens and capsular tension ring (CTR) without retinal detachment until last evaluation.

Symptomatic retinal breaks constitute another category of retinal breaks for which intervention is generally indicated. These breaks are characterized by the perception of increased 'flashers' or 'floaters' and usually occur due to increased vitreoretinal traction exerted during an acute posterior vitreous detachment. Posterior vitreous detachment putatively carry a 10% to 20% risk overall of causing acute breaks. Retinal breaks with persistent vitreous traction at their edge yield retinal detachment 50% of the time and theirfore should be treated with immediate laser retinophexy, which reduces the risk of retinal detachment to less than 5%<sup>8</sup>. An important consideration is the lattice degeneration occurs bilaterally in 45% of patients which raise to treat asymptomatic lattice prophylactically in the contralateral eye. Though no consensus guidelines exist, the estimates of retinal

detachment risk of the contralateral eye is 5% ( and up to 25% in high myopes ) with prophylactic therapy reducing the risk approximately three-fold<sup>8</sup>. About 20% -30% at rhegmatogenous retinal detachment found lattice degeneration and 94% at primer eye. Because lattice degeneration found at 6%-8% population,mostly laser prophylactic must be considered<sup>10</sup>. In this study laser barrage prophylactic underwent at 7 patient with history of retinal detachment in fellow eye.

Side effects of Laser Treatment for a Retinal Tear such as blurring, light sensitivity, perception problems, blind spot, decreased peripheral vision and decreased night vision<sup>11</sup>.In this study all the patients after laser treatment complained moderate pain for several time during laser procedure, blurred vision for about an hour but recovered.

Limitation of our study such us numbers of sample, no retinal photograph for every procedure and lack of discipline of follow up timing from some patients.

## Conclusion

Barrage laser photocoagulation procedure is beneficial for prevention and treatment of peripheral retinal disorders.

## References:

1. Amit Nagpal, Dr, et all : Barrage Laser, NMC Eyecare Advanced Ophthalmology, Viewed May 20<sup>th</sup> , 2018, Available on <http://www.nmceyecare.ae/service/vitreous-and-retina/barrage-laser/>.
2. Lattice Degeneration – Wikipedia , Viewed at May 21, 2018, Available on [https://en.m.wikipedia.org/wiki/Lattice\\_degeneration](https://en.m.wikipedia.org/wiki/Lattice_degeneration).
3. Hemang K Pandya MD, Editor : Andrew A Dahl, MD.FACS, Lattice Degeneration Treatment and Management, Update May 2017 , Available on <https://emedicine.medscape.com/article/1223956-clinical>.
4. Ruwan A S, Mark S, Blumenkranz ; Prophylaxis for Retinal Detachments , American Academy of Ophthalmology , Protecting Sight, Oct 29, 2013, Viewed May 20<sup>th</sup> 2018, Available on : <http://www.aao.org/numnerlyn-laser-surgery-center>.
5. Shukla D , Maheshwari R & Kim R : Barrage laser photocoagulation for macula-sparing asymptomatic clinical rhegmatogenous retinal detachments, Eye 21, 2007, 742-745

6. Linth Wu MD., Chief Editor : Andrew A Dahl MD.FACS , Rhegmatogenous Retinal Detachment Background , Patofisiology , Viewed Feb 24<sup>th</sup> , 2017, Available on , [https://emedicine.medscape.com /article / 1224737-clinical #b.1](https://emedicine.medscape.com/article/1224737-clinical#b.1)
7. Ruwan A S, Mark S, Blumenkranz ; Prophylaxis for Retinal Detachments , American Academy of Ophthalmology , Protecting Sight, Oct 29, 2013, Viewed May 20<sup>th</sup> 2018, Available on : [http/www.aao.org/ numnerlyn- laser-surgery-center](http://www.aao.org/numnerlyn-laser-surgery-center) > .
8. Ashok Garg, Emanuel Rosen , Instant Clinical Diagnosis in Ophthalmology ; Retina and Vitreous, Editor : Jose Maria RM, TM Johnson, Jaffe Brother Medical Pub, New Delhi, 2008, p. 240.
9. Sauli Ari Widjaja, Rhegmatogenous Retinal Detachment Prevention and Predesposing Lesions Management, Naskah East Java Ophthalmology Workshop and Symposium , Surabaya 11<sup>th</sup> – 12<sup>th</sup> May 2018, 26-31 .
10. Moustafa K.N, Hatem M.M, Kareem M,A, The effect of Prophylactic laser barrage treatment before phacoemulsification in high myopia, Menoufia Medical J , 2015, Vol 28,page 203-6.
11. Laura Stuart , Side Effects of Laser Treatment for a Retinal Tear , Azcentral, Update September 30, 2007, Viewed May 22<sup>th</sup> , 2018 , Available at <http://healthyliving.azcentral.com/side-effects-of-laser-treatment-for-a-retinal-tear-121>.