Surgical management of macular holes-indications and complications

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Macular hole surgery is very demand surgery performed due to full-thickness macular rupture characterized by abscence of all retinal layers. Indications for surgery includes stages 3 and 4 regarding to Gass classification. Some authors suggest surgery for stage 2 but results are promising only in anatomical reconstruction. Complications are evident such as cataract, late macular reopening, retinal tears and detachment, visual field defect etc. With improving surgical techniques, the rate of complications became lower.

Key words: macular hole, macular surgery

INTRODUCTION

A macular hole represents a full-thickness retinal defect involving macular area and foveola\(^1\). Due to specific localisation of pathological process, patients experienced painless loss of central vision and/or metamorphopsia.

The first published data presented a numeros cases of a young patients who had history of ocular trauma, but nowadays, it is clear that "idiopathic" macular hole represents two third of all cases. It is known that only 5% to 15% macular holes were accidental or traumatic\(^2\)-\(^4\).

The first who published a comprehensive literature survey was Aaberg\(^2\) but progress in pathological pathways, application of high resolution diagnostic image technology and surgical approach in this area is still significant. Leaving aside all this progress, and not diminishing it, we must mention the scheme published by Gass which covers complete development, both pathological and clinical, of an idiopathic macular hole. Regarding to this, all macular holes were classified into a four stages:

Stage 1 (impending macular hole) \: a fovea-vitreous detachment cause a small lamellar hole. It could resolve even spontaneously

Stage 2 \: in the 6 months interval after stage 1 has appeared, the second stage with full-thickness of macular defect. Size of this stage is approximately \( \approx 400 \cdot \text{m} \)

Stage 3 \: the full thickness defect became larger, the vitreous commonly produce a operculum which "covers" a macular hole

Stage 4: larger defect, complete separation of vitreous

Purpose

Purpose of this article is to review published data regarding to macular hole and to list a precise indication when and how to surgically treat them. It includes authors personal experience in this field of interes, also.

Clinical appearance and symptoms of macular hole

The most of patients experienced metamorphsia and loss of central vision. They have reading difficulty, also. Progression is very slowly and painless. Ophthalmoscopically, a full-thickness defect in macula appears as a yellow round shape ring in the macular area. Slit lamp beam demonstrate a slit beam thinning or a complete gap (Watske Allen test).

DIAGNOSTIC PROCEDURE

To all patients suspect on macular hole, complete ophthamological examination should be done. Besides that, it is useful to make fluorescein angiography and autofluorescence but the "golden standard" is optical coherence tomography (OCT). It is non invasive, highly referent method with threedimensional image of macula through all parts. OCT is sufficient for diagnostic purpose and macular hole evaluation.
DIFFERENTIAL DIAGNOSIS

Hole in epiretinal membrane (ERM) could be confused with true macular hole. The difference is OCT findings - ERM is without full thickness defect and with normal neurosensory retina finding. But ERM is very often associated with macular hole. Afterward, some geographic atrophy of retinal pigment epithelium (RPE) and cystoid macular edema with thin borders are differential with macular hole. Lamellar macular hole is the most difficult to differentiate from a true hole. The edges of lamellar hole were more sloping and borders are less sharp than at a macular hole.

NATURAL COURSE OF MACULAR HOLE

Vitrectomy for Prevention of Macular Hole Study Group has published results about a natural course of early stages of macular hole. Regarding to this results, 40% of patients with stage 1 of macular hole progress a full thickness hole in the following two years period. Eyes with stage 1 has best corrected visual acuity 0.3-0.4 has a 6% risk for progression in a true hole than eyes with BCVA 0.1-0.2 has a progression of 30%. Lamellar macular holes do not progress in a true holes.

Stage 2 demonstrate progression in 96% into stage 3 or 4 and loss of BCVA for two or more Snellen lines in 71% of eyes during the four years. Hikichi published that 55% patients demonstrated enlargement during the 3 years of follow up in stage 3 and 16% patients in stage 4 macular hole. But, in 5-12% patients had spontaneously closing of macular hole.

The progression of lesion is caused by neuroreceptors atrophy and long-lasting cystoid changes in neurosensory retinal nerve fibre layers and due to subretinal fluid accumulation.

MACULAR HOLE SURGICAL TECHNIQUES

The main goal of macular hole surgery is to close hole, stop enlargement of macular defects and to improve visual acuity. Surgery for macular hole includes vitrectomy, fluid-gas exchange and postoperative face-down positioning.

The first step in macular hole surgery is three port pars plana vitrectomy (PPV) with the purpose to remove ERM and posterior vitreous detachment (PVD). Cannula with active suction between 150-250mmHg, moved over the retina on distance around 1mm from the surface. Care should be taken in the macula area if posterior vitreous detachment has occured during the surgery, because of incarceration.

After suction, a careful indirect ophthamoscopic examination for the iatrogenic retina tear is made. It is necessary to wait a few minutes for collecting of residual fluid which should be aspirated. Afterward, aspiration needle dehydrate the vitreous cavity and air-long acting gas(29% SF, 14% C5F8 exchange is performed.

The most demanded surgical techniques in macular hole surgery is peeling of internal limitans membrane (ILM) with purpose to induce reparative gliosis. But, presentation of ILM is very difficult until the introduction of indocyanine green dye which helps in visualization of ILM. Recent results from many studies shown a potential retinal toxicitiy of this dye.

After ILM peeling, it is important to provide tamponade of hole edges. The best choice is air or gas bubble with or without vitrectomy. Silicone oil also provide a good tamponade with long lasting effects and the less important "facedown" postoperative positioning but the results are not so favorable as with gas using. Some surgeon use autologous serum to stain ILM and PVD.

After macular hole surgery, in the following 24 hours strictly and a few days afterward, patient should be in a special position (face down positioning).

COMPLICATIONS

As it is wellknown, any surgical procedure carries a risk of complications, and macular hole surgery is no exception. The immediate "complication" of macular hole is face down positioning. Patients with degenerative neck and back changes, sinus pathology etc. will experienced a lot of subjective complains on it. The second complication is cataract formation (up to 81% after 2 years) requiring surgery in 25%cases.

Glaucoma occurs mostly in the first two weeks after surgery with IOP more than 30mmHg. Other surgical complications are retinal tear (14%), rhegmatogenous retinal detachment (14%), late reopening (2-7%),RPE alteration (1%) , exudative retinal detachment, and proliferative vitreoretinopathy.

There is a visual field defect described as a dense and wedge-shaped defects affecting temporal field. The possible machanism is traumatic damage peripapillary retinal fibre layers during separation of posterior hyaloid or dessication of supero temporal retina by air jet from the opposite direction.

RESULTS OF MACULAR HOLE SURGERY

The Fully Developed Full Thickness Macular Hole Study analysed stage 3 and 4 of lesions. At 6 months follow up results in macular close in 69% and better visual acuity than observed group.23 The macula is very important for a normal vision, especially for reading and driving. The results of this study show a high rate of success and improvement in two or more lines of BCVA in 55% cases.

PERSISTANT OR RECURRENT MACULAR HOLE

In cases with persistent or recurrent macular hole, PPV with gas-fluid exchange should be performed again. Success of this re-surgery is up to 87% of cases. Some authors suggests to introduce adjuvants such as autologous serum and bovine but the success is more or less the same (80% and 83%). Some surgeon performed laserphoticocalgulation followed by fluid-gas exchange and some fluid-air exchange only.
CONCLUSION

Macular hole surgery is indicated in the cases of macular holes- stages 3 and 4 and has a promising results. In the stage 1, it is better to follow up patients in monthly basis than to make a surgery. Macular hole surgery is demanded surgery, anatomical "plugging" of hole is successful. Despite apparent anatomic success, some patients still do not have improvement in visual acuity.

Macular hole surgery without imaging technology such as OCT is almost impossible mission. OCT could provide more information regarding to pathogenesis of macular hole as well as to implicate some new operating technique.

SUMMARY

Hirurgija rupture makule je veoma zahtevna hirurška intervencija koja se izvodi usled potpunog istanjenja ili odsustva svih slojeva retine u regiji makule. Indikacije za hirurgiju uključuju stadijume 3 i 4 prema Gass klasifikaciji. Neki autori predlažu operaciju u stadijumu 2 ali obećavajući rezultati se postižu samo u anatomskom smislu. Komplikacije su evidentne i to su katarakta, kasna ponovna ruptura, rupture i ablacija retine, defekti u vidnom polju idr. Unapredjenjem hirurške tehnike, stepen komplikacija postaje manji.

KLjučne reči: ruptura makule, hirurgija makule

REFERENCE


