5 Surgery – an Overview

JAN ZURDEL and KATRIN ENGELMANN

CONTENTS

5.1 Introduction 33
5.2 Surgical Removal of Choroidal Neovascular Membranes 33
5.2.1 Surgical Technique 33
5.2.2 Results 34
5.2.3 Complications 34
5.3 Surgery in Subretinal Hemorrhage 34
References 35

5.1 Introduction

Since the late 1980s, surgical techniques have become available for submacular surgery in choroidal neovascularization (CNV) and associated subretinal hemorrhages secondary to age-related macular degeneration (ARMD). Results of surgical removal of CNV are encouraging, given the poor prognosis for visual acuity in the natural course of the disease, and stabilization of vision seems to be the most likely outcome. However, although removal of CNV can be accomplished, the strong tendency toward recurrence is a pending threat for patients who have undergone surgery. Moreover, the operation itself causes damage to the tissue in the vicinity of the choroidal neovascular membrane and thus limits the benefits.

Removal of subretinal hemorrhages can be achieved by using tissue plasminogen activator and expansible gas, possibly in combination with vitrectomy but, again, long-term results depend on the underlying cause of the bleeding.

A general therapeutic regimen does not exist and the decision for treatment should be individually designed according to the patient’s specific circumstances.

5.2 Surgical Removal of Choroidal Neovascular Membranes

Among the first patients to undergo subretinal surgery to remove CNV in ARMD were four reported in 1988 by DE JUAN and MACHEMER. At that time, due to retinal detachment and proliferative vitreoretinopathy, visual outcome was very poor, with none of the patients having visual acuity (VA) better than 5/200. Thereafter, some encouraging reports with favorable visual outcomes were reported (SLUSHER 1989), reigniting hopes that this approach might be beneficial in these patients who were otherwise threatened by severe visual loss.

Until now, indications for surgical removal of choroidal neovascular membranes (CNVM) have not been defined unambiguously, since data consist of small case series and no large randomized clinical trials are available. However, reliable data on the natural history of patients come from large control groups of the Macular Photocoagulation Study (MPS). Therefore, data from surgically treated patients may well be compared to these control groups.

5.2.1 Surgical Technique

A standard three-port vitrectomy is performed and the posterior hyaloid is elevated. Then, a small retinotomy is needed in the vicinity of the neovascular lesion, usually temporally to the macula, and balanced salt solution or viscoelastic is injected into the subretinal space to separate the retina from the underlying tissue, including the CNVM. The CNVM is mobilized and removed using a subretinal forceps. Endolaser coagulation or endocryocoagulation may be performed at the site of the retinotomy. Finally, fluid is exchanged for air or expansible gas, and the patient is positioned face-down for several days to allow tamponade of the macula by the gas bubble.
5.2.2 Results

Several studies indicate that it is possible to stabilize visual acuity (VA) in the majority of patients, whereas considerable improvement or severe worsening of VA are less frequent (MERRILL et al. 1999; THOMAS et al. 1994). The mean changes of VA in these studies have been about zero. Nonetheless, attention must be paid to the duration of follow-up and the inclusion criteria. With longer follow-up, more patients experience recurrences and related visual loss. The overall rate of recurrence is estimated to be 30%, somewhat lower than after laser photocoagulation; in the MPS trials, the rates of recurrence were slightly above 50%, depending on the location of CNV.

In ARMD, neovascular membranes usually grow underneath and above the RPE, a pattern causing significant damage to the RPE and choriocapillaris during removal of the CNVM. Surgery may, therefore, cause severe trauma to underlying tissues necessary for survival of photoreceptors and thus limit the benefits of the procedure, as demonstrated in a 1-year follow-up after surgery in a case series (CASTELLARIN et al. 1998). Therefore, preoperative selection of patients appears to be important with respect to visual outcome.

However, other evidence suggests that surgical removal of CNVM did not benefit patients. TSUJIKAWA et al. (1999) demonstrated that excision of CNVM did not improve central retinal sensitivity, and patients had poor visual outcome in most cases. However, in some cases sensitivity could be preserved and visual outcome was relatively good following surgical CNV removal. So far, it is not well understood why, in some patients, the surgically damaged area remains functionally well preserved postoperatively (LOEWENSTEIN et al. 1998). SCHRÖDER et al. (1999) reported a prospective study including 54 eyes which were subcategorized into three subtypes according to the MPS: well-defined (classic) CNV, ill-defined (occult) CNV, and submacular hemorrhage. They demonstrated that subfoveal surgery might preserve remaining retinal function in eyes with well-defined CNV but that eyes with occult CNV or hemorrhages did not benefit from surgery. In contrast to this prospective study, retrospective analyses revealed no correlation between visual outcome and type of CNV, presence of hemorrhage, or duration of visual symptoms (BENSON et al. 1998).

Interestingly, results of surgery seem to be better with different CNV etiology, e.g., results were remarkably good in CNV associated with presumed ocular histoplasmosis syndrome (THOMAS and KAPLAN 1991).

All in all, removal of CNVM in ARMD seems to be a viable method of halting visual loss which otherwise threatens the majority of patients. Stabilization of VA, which most of the studies suggest is the average outcome, is a considerably better prospect for these patients compared to the natural history of the disease (see chapter 2). Meanwhile, other surgical techniques, namely macular translocation, have evolved and their results will have to be compared to conventional removal of CNVM.

5.2.3 Complications

Excision of CNV may lead to RPE loss followed by atrophy of neighboring tissue. Some clinical studies indicate benefit only for removal of membranes lying above the RPE. After CNVM excision, 75% of patients showed new areas of decreased choriocapillaris perfusion (NASIR et al. 1997).

Development of cataract is a known postoperative complication after vitrectomy for other indications, e.g., removal of epiretinal membranes or macular hole surgery. The rate of complications increased with the size of CNV and the extent of manipulation. In conclusion, results now do not warrant a general recommendation for CNVM surgery (STRMEN and HASA 1996) and an individual approach and assessment of possible benefits and risks appear to be necessary (ECKARDT 1996).

5.3 Surgery in Subretinal Hemorrhage

Subretinal hemorrhage may be a complication of CNV. Small amounts of blood are frequently seen associated with these lesions, but extensive subretinal bleeding is relatively rare. Surgical removal of subretinal hemorrhages and membranes in ARMD eyes is feasible from a technical point of view. However, an advantage over the natural course has not yet been established. Nevertheless, a reduction of central scotoma size can be achieved by surgical intervention (PETERSEN et al. 1998). Other studies demonstrated that only intravitreal injection of tissue plasminogen activator (TPA; 25–100 μg) followed by an additional injection of expansible gas (0.3–0.4 ml perfluoropropane or sulfur hexafluoride) without surgery