






# Learning Pars Plana Vitrectomy Procedure for Retinal Detachment

 Pınar Eröz<sup>1</sup>,  Ömer Özer<sup>2</sup>,  Erdem Dinç<sup>3</sup>,  Emre Can Yılmaz<sup>3</sup>,  Pınar İş Kılıçdoğan<sup>4</sup>

1 Tarsus State Hospital, Clinic of Ophthalmology, Mersin, Türkiye

2 Niğde Ömer Halisdemir University, Department of Ophthalmology, Niğde, Türkiye

3 Mersin University, Department of Ophthalmology, Mersin, Türkiye

4 Şanlıurfa Training and Research Hospital, Clinic of Ophthalmology, Şanlıurfa, Türkiye

## Abstract

**Aim:** This study aimed to observe the development of surgical technique and anatomical success during the first 7 years of a new surgeon's performing retinal surgery.

**Methods:** Patients undergoing PPV surgery between January 2017 and January 2024 by an inexperienced surgeon in vitreoretinal surgery were studied. Surgical technique, tamponade type and anatomical success were recorded.

**Results:** Anatomical success was achieved in 88.1% of patients at the first surgery. There was no significant difference between groups in the number of surgeries required to achieve anatomical integrity and retinal stabilisation. ( $p=0.64$ ). There was a statistically significant difference between groups in the type of tamponade used ( $p<0.001$ ).

**Conclusion:** In this study, primary anatomical success was not related to number of vitreoretinal procedures. To achieve acceptable success rates, the learning curve for less experienced surgeons requires sufficient time. Although surgical experience is not the only factor influencing the outcome of retinal detachment surgery, it is a powerful factor in the success of the operation

**Keywords:** retinal detachment; pars plana vitrectomy; learning; inexperienced vitreoretinal surgeon

## 1. Introduction

Primary pars plana vitrectomy (PPV) is a widely accepted procedure for the treatment of uncomplicated rhegmatogenous retinal detachment (RRD) as a result of advances in vitrectomy technique<sup>1</sup>. The advantages of primary vitrectomy are that the surgeon can see small retinal tears intraoperatively and remove vitreous traction, and all intraoperative retinal applications can be performed with fluid-air exchange<sup>2</sup>.

The learning applies to many procedures and specialities, but in medicine, and particularly in surgery, it is an issue that needs to be considered and discussed as it can have potentially serious consequences. The learning curve in surgery is often used to describe how difficult it is to master a procedure, and outcome measures are usually the complication and failure rates. This is why the success rate of surgery is also known as the surgical learning curve.

Surgical learning curves are typically defined as the change in a surgical parameter over time. Studies of learning for surgical procedures are becoming increasingly important as learning curves can


have an impact on surgical measures, clinical outcomes and cost-benefit decisions<sup>3</sup>. Vitreoretinal surgery is considered to have one of the longest learning, despite the lack of standardisation.

After reaching a certain level of proficiency in surgical technique, a temporary loss of performance may occur. It is thought that taking on more challenging cases and increasing the surgeon's confidence may cause this situation<sup>4</sup>.

The aim of this study was to evaluate the minimum learning time required for a new surgeon to manage during the first 7 years of retinal surgery by observing the evolution of surgical technique. We also wanted to determine the optimal number of surgeries required for successful pars plana vitrectomy for retinal detachment.

## 2. Materials And Methods

Ethical approval was obtained from the Mersin University Faculty of Medicine Clinical Research Ethics Committee and the study was conducted according to the principles of the Declaration of Helsinki. Patients who were treated with PPV for RRD between January 2017 and January 2024 and had at least 12 months of postoperative follow-up were included in the study. Eyes with proliferative vitreoretinopathy (PVR) grade C or higher, eyes with penetrating eye injury, or eyes with a history of other vitreoretinal surgery were excluded. Difficult cases such as those with high myopia, macular holes, and syndromic diseases were excluded from the analysis. The number of cases was divided into quartiles to group the cases. Med-

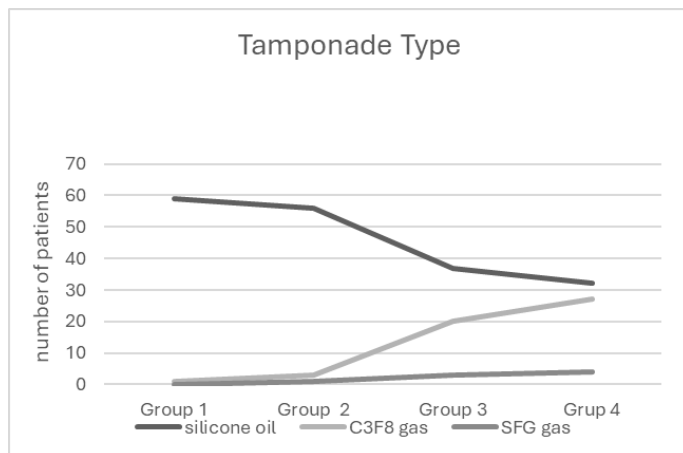
Corresponding Author: Pınar Eröz, p.eroz@hotmail.com, Received: 23.08.2024, Accepted: 26.12.2024, Available Online Date: 31.12.2024 Cite this article as: Eröz P, Özer Ö, Dinç E, Yılmaz EC, Kılıçdoğan PI. Learning Pars Plana Vitrectomy Procedure for Retinal Detachment. J Cukurova Anesth Surg. 2024; 7(4): 220-2. <https://doi.org/10.36516/jocass.1543194> Copyright © 2024 This is an open access article distributed under the terms of the Creative Commons Attribution-Non-Commercial-No Derivatives License 4.0 (CC-BY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal. 

ical records and optical coherence tomography (OCT) images (Heidelberg HRA-OCT Spectralis®, Heidelberg Engineering GmbH, Heidelberg, Germany) of all patients included in the study were retrospectively reviewed.

All operations were performed by the same surgeon under general anaesthesia using 23G vitrectomy equipment (Constellation vitrectomy unit; Constellation®, Alcon, Fort Worth, TX, USA). A complete vitrectomy with vitreous base cleaning, tear flap excision and internal fluid drainage was performed in all cases. Scleral buckling was not performed in any patient. Laser or cryopexy was applied to the tear areas according to the surgeon's preference. Depending on the difficulty of the case, 1000 centistokes silicone oil, SF6 (GOT Multi SF6; Alchimia, Beijing) or C3F8 (GOT Multi C3F8; Alchimia, Beijing) was chosen by the surgeon. Phacoemulsification and intraocular lens implantation were performed in phakic patients before vitrectomy. At the end of the operation, 23G trocars were removed and transconjunctival suture was performed using 7/0 vicryl. All patients received postoperative subconjunctival gentamicin sulphate 20 mg (Genta ampoule, I.E. Ulugay, Istanbul, Turkey) and dexamethasone 4 mg (Dekort ampoule, Deva, Istanbul, Turkey). Anatomic success was defined as a flat retina in the first 6 months after removal of silicone oil or gas tamponade after PPV. (fig 1)

**Figure 1**

Distribution of tamponade type preference according to groups



### 2.1. Statistical analyses

Statistical analysis of the study data was performed with the SPSS 24.0.1 package programme (IBM Corp, Armonk, NY, USA). Categorical variables were expressed as number (n) and percentage (%) and numerical variables were expressed as mean  $\pm$  standard deviation. The normal distribution of continuous variables was checked by the Shapiro-Wilk test. Student's t test and one-way ANOVA test were used to compare the means of the groups. The relationship between categorical variables was investigated by Chi-Square analysis. The statistical significance level was taken as  $p < 0.05$  for all comparisons.

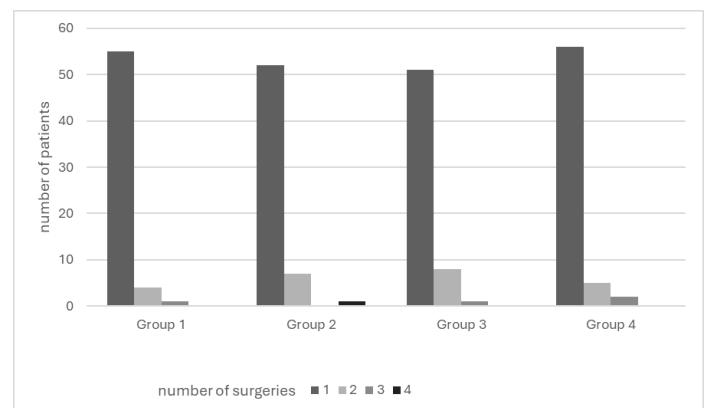
### 3. Results

There were 179 male (73.7%) and 64 female (26.3%) patients included in the study. The mean age of the 243 patients included in the study was  $60.51 \pm 9.96$  years, and there was no statistically significant difference in age between the groups ( $p = 0.24$ ). Combined

surgery was performed in 55.6% of the patients, while 44.4% underwent vitrectomy only. In group 2, only one patient underwent 4 surgeries to ensure anatomical success, while the maximum number of surgeries was 3 in the other groups. (Fig 2) At the first surgery, 88.1% of patients achieved anatomical success. While 29 patients underwent more than one operation, the surgical success rate was 97.3% for the second operation and 99.6% for the third. Silicone tamponade was the most preferred tamponade in all groups at surgery. There was no significant difference between the groups in terms of gender distribution and surgical direction ( $p = 0.47$ ,  $p = 0.64$ , respectively). There was no significant difference between the groups in the preference for combined surgery or vitrectomy ( $p = 0.06$ ). There was no significant difference in the number of surgeries required to achieve anatomical success between the groups ( $p = 0.64$ ). The difference between the groups in terms of the type of tamponade used was statistically significant ( $p < 0.001$ ).

**Figure 2**

Number of surgeries according to groups



### 4. Discussion

Surgical learning are defined as the time and number of operations required for a surgeon to successfully perform a new surgical procedure<sup>5</sup>.

Surgical experience is widely recognised to significantly influence surgical outcome, performance and management of potential complications. Using smaller diameter surgical instruments requires more precision and caution, but offers benefits including faster surgery, less tissue manipulation, decreased infection, less post-operative pain and faster visual recovery. If smaller incisions are made with smaller instruments, it may be more difficult to pass the instruments through the ports. Between 20 gauge procedures requiring sutures and 25 and 27 gauge procedures with smaller but more limited applications, 23 gauge techniques and instruments offer an ideal compromise for many surgeons<sup>6</sup>.

In a study of retinal surgeons in Alberta, the minimum number of operations required for successful retinal detachment surgery was one and the maximum was five. The overall average success rate for all surgeons was 84.9% (3,680/4,336) and if a second operation was required, the overall success rate for this operation was 79.1% (519/656). The highest success rate was seen in patients aged 90-99 years, and the lowest in patients aged 0-9 years<sup>7</sup>. Success rates stabilise after 500 operations, according to a German study. There was no correlation between the total number of surgeries and the primary anatomical success rate. There was no significant dif-

ference between the learning curves for vitrectomy and scleral buckling, and there was no correlation between the primary anatomical achievement of the surgeon and the total number of vitreoretinal surgeries performed by the surgeon.<sup>8</sup> In contrast, studies of RRD surgery performed by inexperienced retinal surgeons have reported primary success rates of 70% to 80%, with approximately 200 operations and learning after 2 years<sup>2,9</sup>. Dugas et al. showed a learning curve effect where the success rate increased from 66.7% in the first 60 cases of PPV to 80% in the last 60 cases<sup>2</sup>. The switch to the 23G technique after approximately 100 operations is perceived by the surgeon to be more comfortable and safer<sup>10</sup>. In the present study, no correlation was found between the number of surgeries and primary anatomical success rate. In terms of surgical stability, we believe that an average of 60 surgeries is a sufficient number.

According to a study conducted in China, the number of years a surgeon spends in the profession is not directly related to the intensity of surgery. More experienced surgeons had a longer interval than less experienced surgeons for complicated operations<sup>11</sup>. Similarly, the present study did not find a direct relationship between years of practice and surgical intensity. As complicated cases were excluded from the study, there was no decrease in performance due to difficult cases and similar surgical success was observed in all groups.

In the present study, the preference for silicone tamponade was predominant at the beginning of surgery, while there was a statistically significant increase in the preference for gas tamponade from the third trimester onwards. It can be concluded that the surgeon believes he has achieved technical competence and is trying different techniques.

In a study of 3786 RD procedures performed by 10 surgeons early in their vitreoretinal careers, female surgeons had a faster learning curve and a primary success rate of 90% (3420 of 3786). There are differences in learning curves between surgeons and it has been shown that the number of operations alone is not an indicator of skill level<sup>9</sup>. The improvement in visual acuity does not match the rate of anatomical improvement<sup>12</sup>. In this study, primary anatomical success was not related to number of vitreoretinal procedures.

One of the limitations is the retrospective and single-centre nature of the study.

It is important to be fully equipped from the outset, although some complications are inevitable. Practical training on animals and the use of simulation equipment will be useful in the surgical management of intraoperative complications. Learning for inexperienced surgeons require time to achieve acceptable success rates. Although surgical experience is not the only factor influencing the outcome of retinal detachment surgery, it is a powerful factor in the success of the operation.

### Statement of ethics

Ethical approval was obtained from the Mersin University Faculty of Medicine Clinical Research Ethics Committee and the study was conducted by the principles of the Declaration of Helsinki (27/12/23 2023/897). Informed consent forms were obtained from all patients and control subjects.

### Source of Finance

The authors declare that they have received no financial support for this study

### Conflict of interest statement

The authors declare that they have no conflict of interest.

### Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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