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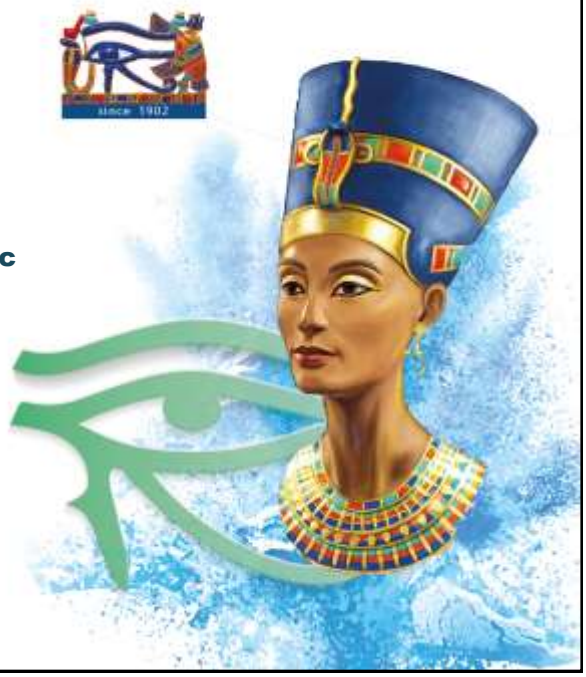

Persistent Subretinal Fluid Following Diabetic Tractional Retinal Detachment Repair: Risk Factors, Natural History, and Management Outcomes

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CONTENT

- INTRODUCTION
- METHOD
- RESULTS
- DISCUSSION
- CONCLUSION

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- Tractional complications of advanced proliferative diabetic retinopathy remain a major indication for vitrectomy.
- Surgery for tractional retinal detachment (TRD) and traction-rhegmatogenous retinal detachment TRRD has variable visual outcomes and several prognostic factors.
- The main prognostic factors include chronicity of the macular detachment, photoreceptor integrity and macular perfusion status.
- In a subset of patients following successful vitrectomy for TRD or TRRD, a residual submacular fluid is noted.
- Few reports attempted to characterize residual subretinal fluid (SRF) after TRD/TRRD repair. However, the natural history and the effect on final visual acuity remain largely unknown.

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Purpose:

To study the natural history, anatomical and functional outcomes of persistent subretinal fluid (SRF) after pars plana vitrectomy (PPV) for diabetic tractional retinal detachment (TRD) and combined traction-rhegmatogenous retinal detachment (TRRD).

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Methods:

Retrospective interventional case series of patients with persistent SRF following PPV for diabetic TRD or combined TRRD from January 2010 to December 2017. Study at King Khaled Eye Specialist Hospital, Riyadh, Saudi Arabia IRB approved

- **Primary outcomes** included best corrected visual acuity (BCVA) and central foveal thickness (CFT).
- **Inclusion criteria** included patients 18 years old or more, persistent SRF involving the macula documented by spectral domain optical coherence tomography (SD-OCT), no detectable retinal break clinically or by SD-OCT, and at least six months of follow up postoperatively.
- **Exclusion criteria** included detectable retinal breaks, lack of OCT documentation and media opacity precluding OCT imaging.
- **Postoperative interventions included observation, intravitreal injection of triamcinolone (IVTA), or reoperation.**

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Surgical technique

- Standard pars plana vitrectomy was performed by multiple surgeons.
- In all cases, all tractional membranes were removed.
- Internal drainage (passive or active)of the subretinal fluid (SRF) was carried out if a preexisting or an iatrogenic retinal break was observed intraoperatively.
- Perfluorocarbon liquid was used to displace the SRF if the break was not posterior.
- Different tamponade agents were used, based on surgeon decision intraoperatively, including air, a non-expansile concentration of 14% perfluoropropane (C3F8) or 20% sulfur hexafluoride (SF6) or silicone oil.

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Results:

- **Forty-six eyes from 43 patients were included, including 28 (65.1%) males and 15 (34.9%) females. The mean age (±SD) at the time of primary surgery was 51.5 ±10.4 years. The mean (±SD) follow-up duration was 21 ±13.2 months.**
- **The mean duration of decreased vision before the presentation was 48.0 ±58.2 weeks (median 25.7 weeks). Thirty-one eyes (67.4%) had macula-off TRD, 5 (10.9%) had macula partially off fovea-threatening TRD and 10 (21.7%) had combined TRRD .**
- **Membrane dissection-related breaks occurred in 17 eyes (37.0%). Intraoperative drainage of SRF was done in 16 eyes (34.8%) and perfluorocarbon liquid was utilized in 7 eyes (15.2%). The most commonly used tamponading agent was silicone oil in 15 eyes (32.6%) followed by SF6 20% in 10 eyes (21.7%).**
- **Among all eyes, 13 eyes underwent intervention to address the SRF. Intravitreal triamcinolone acetonide was given in one eye, vitrectomy with SRF drainage and a tamponading agent in 11 eyes, and one eye received both interventions. The mean time for interventions was 8.5 ±4.4 months.**

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clinical characteristic:

Characteristic	n (%)
Age at presentation (years), mean ±SD [Range]	51.5 ±10.4 [21.1-70.1]
Laterality	
Unilateral	40 (93.0)
Bilateral	3 (7.0)
Eye	
OD	23 (50.0)
OS	23 (50.0)
DM	
Type 1	10 (23.3)
Type II	33 (76.7)
Duration of decreased vision (days), mean ±SD [Range]	336.2 ±407.4 [5-2052]
Duration of decreased vision (weeks) (missing 5)	
≤14	12 (29.3)
>14	29 (70.7)
VA at presentation (LogMAR), mean ±SD [Range]	1.62 ±0.88 [0.18-3.00]
VA at presentation	
≥20/100	9 (19.6)
<20/100	37 (80.4)
VA at 1st postop 4-6 weeks (LogMAR), mean ±SD	1.58 ±0.94 [0.30-3.00]
VA at 3 months (LogMAR), mean ±SD [Range]	1.33 ±0.82 [0.18-3.00]
VA at 6 months (LogMAR), mean ±SD [Range]	1.24 ±0.79 [0.18-3.00]
VA at 12 months (LogMAR), mean ±SD [Range]	1.10 ±0.70 [0.10-3.00]
VA at final follow-up (LogMAR), mean ±SD [Range]	1.05 ±0.76 [0.10-3.00]
VA at final visit	
≥20/50	9 (19.6)
<20/50	37 (80.4)

70%

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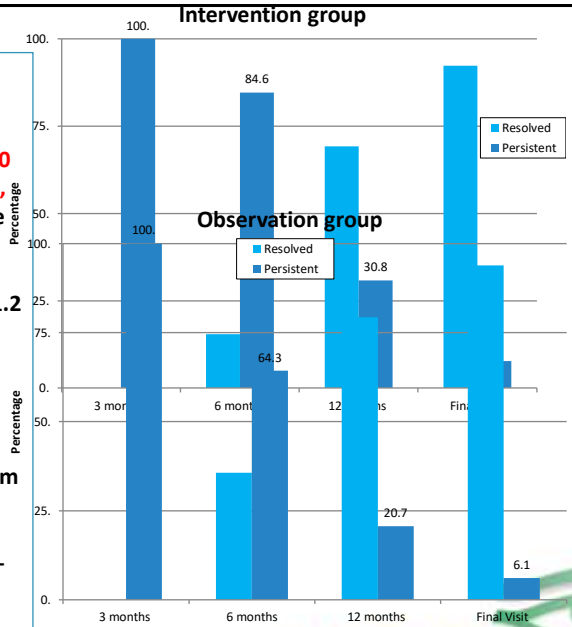
Anatomical outcome :

- **Residual macular SRF was detected by SD-OCT exam in all eyes at three months, 29 eyes (70.7 %) at six months and 10 eyes (23.8 %) at 12 months after surgery. At final follow up, only three eyes (6.5%) had persistent submacular fluid. The mean time to resolution was 10.6 ±4.1 months [range 6.0-23.0].**
- **The mean CFT was 542.8 ±177.1 μm, 489.5 ±174.8 μm, 431.2 ±163.7μm, 339.9 ±182.1 μm at 1, 3, 6 and 12 months postoperatively, respectively. At the final follow-up, the mean CFT was 259.6 ±84.0 μm (P-value <0.001).**
- **The mean SRF height at 3 months was 253.4 ±169.0 μm, dropping to 56.8 ±116.2 μm at 12 months and 12.8 ±59.4 μm at the final visit for those eyes who did not have complete resolution. There was a statistically significant difference between the final follow-up and first postoperative visit (p-value <0.001).**



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Anatomical outcome :

- **Of eyes that did not have complete SRF resolution by 12 months (10 eyes) versus eyes that completely resolved showed that these eyes had higher CFT at the 1st postoperative visit (751.0 ±151.2 μm) compared to resolved eyes (493.1 ±147.8 μm) (P value=0.007).**

- **However, CFT at 3 months was not statistically significantly different between both groups (P value=0.237) (544.9 ±84.8 μm in non-resolved eyes versus 489.1 ±196.3 μm in resolved eyes). Also, SRF height at 3 months was higher (348.4 ±147.0 μm) compared to resolved eyes (237.7 ±178.5 μm) at 3 months but no statistical significance was found (p value=0.062). In these 10 eyes, only one eye had Intraoperative drainage of SRF (P value=0.101)**

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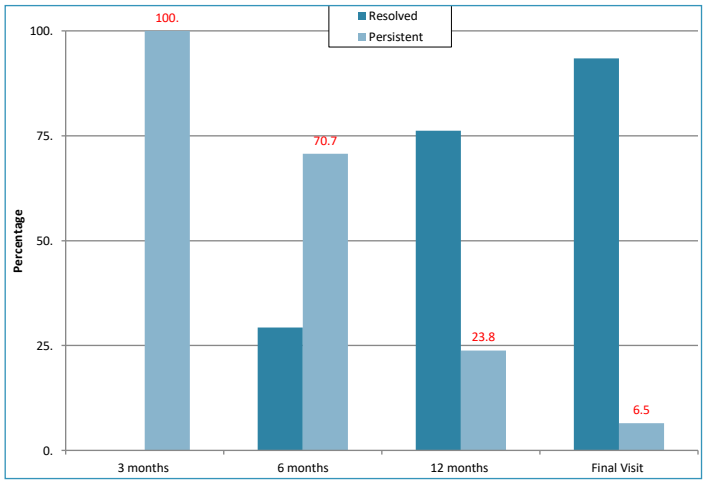
The percentage of eyes with SRF resolved vs. persistent among different visit for the whole sample



The final resolution rate of macular SRF was 93.5% (43/46 eyes) with only three eyes without a complete resolution at the end of the study.

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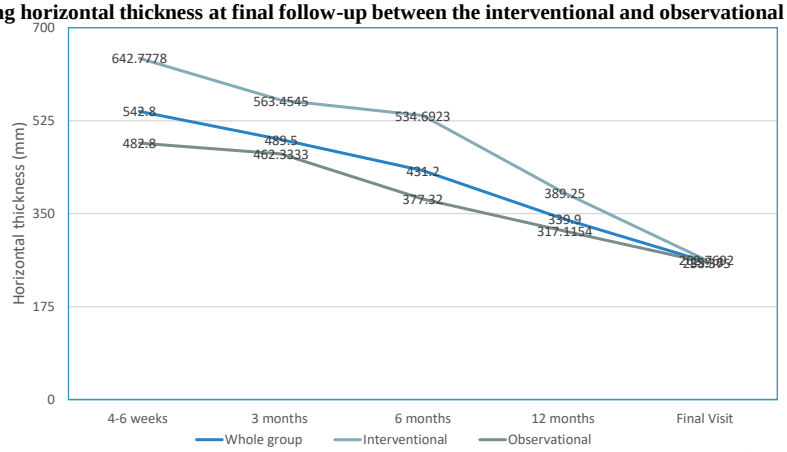
OCT thickness for the whole, observation and intervention group

Comparing horizontal thickness at final follow-up between the interventional and observational group, p value=0.876



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Variable	SRF Resolved (n=32) n (%)	SRF Persistent (n=10)	P val
Gender			
Male (n=29)	20 (69.0)	9 (31.0)	0.10
Female (n=13)	12 (92.3)	1 (7.7)	
Age (years)			
≤55 (n=24)	19 (79.2)	5 (20.8)	0.66
>55 (n=18)	13 (72.2)	5 (27.8)	
Laterality			
Unilateral (n=37)	28 (75.7)	9 (24.3)	0.83
Bilateral (n=5)	4 (80.0)	1 (20.0)	
Eye			
OD (n=21)	17 (81.0)	4 (19.0)	0.46
OS (n=21)	15 (71.4)	6 (28.6)	
DM			
Type 1 (n=10)	8 (80.0)	2 (20.0)	0.74
Type II (n=32)	24 (75.0)	8 (25.0)	
Duration of decreased vision (weeks) (5 missing)			
≤14 (n=11)	7 (63.6)	4 (36.4)	0.26
>14 (n=26)	21 (80.8)	5 (19.2)	
VA at presentation			
≥20/100 (n=9)	9 (100)	0 (0.0)	0.05
<20/100 (n=33)	23 (69.7)	10 (30.3)	
VA at final visit			
≥20/50 (n=8)	7 (87.5)	1 (12.5)	0.46
<20/50 (n=34)	25 (73.5)	9 (26.5)	
TRD Macula ON			
Yes (n=7)	6 (85.7)	1 (14.3)	0.51
No (n=35)	26 (74.3)	9 (25.7)	
TRD Macula OFF			
Yes (n=28)	21 (75.0)	7 (25.0)	0.75
No (n=14)	11 (78.6)	3 (21.4)	
Combined TRRD			
Yes (n=15)	10 (66.7)	5 (33.3)	0.28
No (n=27)	22 (81.5)	5 (18.5)	
Triamcinolone use			
Yes (n=35)	26 (74.3)	9 (25.7)	0.51
No (n=7)	6 (85.7)	1 (14.3)	
PFCL use			
Yes (n=5)	5 (100.0)	0 (0.0)	0.19
No (n=37)	27 (73.0)	10 (27.0)	
Intraoperative drainage of SRF			
Yes (n=13)	12 (92.3)	1 (7.7)	0.10
No (n=29)	20 (69.0)	9 (31.0)	
Reoperations			
Yes (n=12)	9 (75.0)	3 (25.0)	0.90
No (n=30)	23 (76.7)	7 (23.3)	
Group			
Intervention (n=13)	9 (69.2)	4 (30.8)	0.47
Observation (n=29)	23 (79.3)	6 (20.7)	
Type of tamponade			
CSF6 (n=6)	6 (100)	0 (0.0)	0.48
SF6 (n=10)	7 (70.0)	3 (30.0)	
Regular S.O (n=12)	10 (83.3)	2 (16.7)	
Air (n=9)	6 (66.7)	3 (33.3)	
None (n=5)	3 (60.0)	2 (40.0)	

Variable	P value	RR	95% CI
Gender - female	0.222	2.539	0.568-11.338
VA at presentation - ≥20/100	0.558	0.592	0.102-3.425
Iatrogenic break - yes	0.782	1.392	0.134-14.454
PFCL use - yes	0.151	0.125	0.007-2.136
Intraoperative drainage of SRF - yes	0.350	4.225	0.206-86.527

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Anatomical outcome :

- In a subgroup analysis of TRRD eyes (10 eyes), 5 eyes underwent additional interventions for persistent SRF and 5 eyes were observed.
- At final visit, all eyes had complete SRF resolution (100%), In the observed eyes, 3 eyes (75%) had persistent SRF at their 6-month-visit, two eyes (50%) at 12-month-visit. In the intervention group, 5 eyes (100 %) had persistent SRF at their 6-month-visit, one eye (20%) at 12 month-visit. No statistical significance was found between both groups (p-value >0.05).
- No statistical significance was found in rate of SRF resolution for CTRRD eyes compared to TRD eyes at 12 months and at final follow-up (P-value= 0.457 & 0.345).

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Visual outcome :

- Overall, the mean BCVA ±SD improved from 1.62 ±0.88 LogMAR (counting fingers Snellen equivalent) preoperatively to 1.05 ±0.76 LogMAR (20/250 Snellen equivalent) at the final follow-up (P value<0.001).
- Significant improvement is also observed in final follow-up compared to post-operative mean BCVA ±SD (1.58 ±0.88 LogMAR, P value<0.001).

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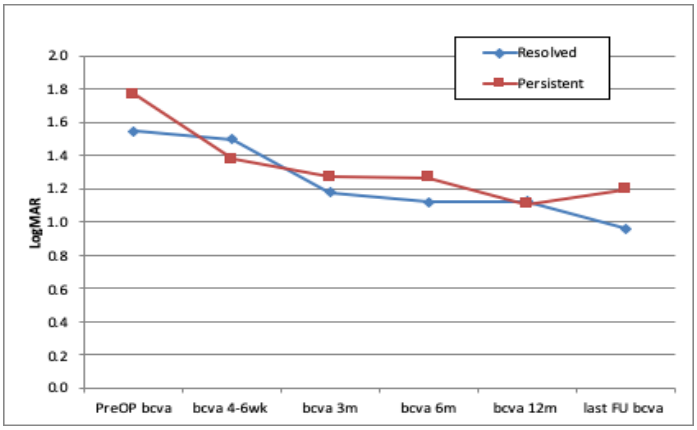
Comparison Of mean BCVA in logMAR among different visits

No statistical difference in final BCVA was found between eyes that had intervention 1.0 ±0.8 LogMAR versus eyes that were observed 1.1 ±0.8 LogMAR (P value= 0.762)



No statistical Signiant was found in final BCVA of CTRRD eyes compared to TRD eyes at final follow-up (P value= 0.895)

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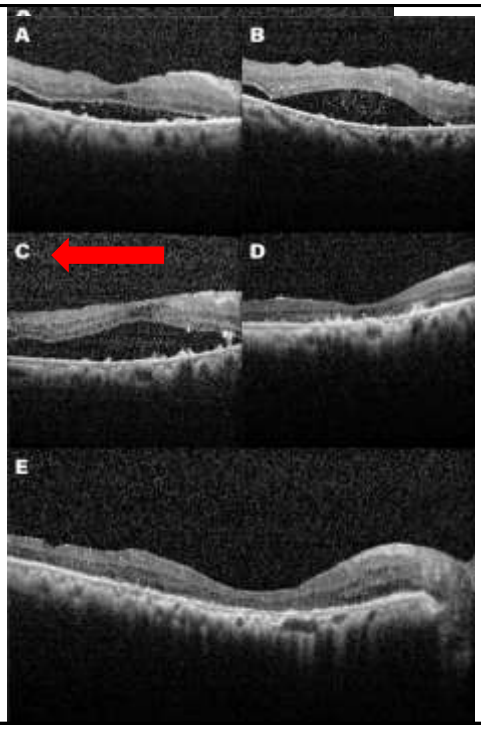

Post-operative clinical course of a 64-year-old following vitrectomy for traction retinal detachment (TRD).

Serial postoperative SDOCT for a 51-year-old following vitrectomy for traction-rhegmatogenous retinal detachment. The patient underwent a second vitrectomy with internal drainage 7 months after the initial surgery.

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Discussion :

The main findings of the study are:

1- Resolution of macular SRF after diabetic vitrectomy is slow and might need more than 12 months to resolve completely.

2- Resolution of macular SRF is associated with improvement in visual acuity

3- Further surgical interventions to drain SRF did not significantly affect the final visual outcome; however, it may speed up the resolution of fluid and consequently hasten visual recovery.

- The gradual resolution of SRF is consistent with previous reports of persistent SRF following diabetic vitrectomy .In our study, the mean time of resolution is longer (10.6 ±4.1 months), which might be explained by the significant chronic nature of TRD in our sample compared to others.

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- **Association between the persistence of SRF and delayed visual recovery.**
- **Composition of SRF. RRD &optic pit maculopathy.**
- **Although the nature of SRF may be different in eyes with combined TRRD, the resolution rate and final visual outcome were not different when compared to TRD eyes in our study.**

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limitations :

retrospective nature, lack of control group and multiple surgeons involved in patients' care. Structural changes on SD-OCT were not objectively studied.

However, it is the largest series so far and provides insight on the natural history of macular SRF following diabetic vitrectomy.

Conclusion :

persistent macular SRF may be seen following vitrectomy for diabetic TRD or TRRD. The SRF usually resolves slowly over time with gradual improvement in visual acuity and drainage of persistent SRF may not be necessary.

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References

1. Flynn, H. W., Jr., Chew, E. Y., Simons, B. D., Barton, F. B., Remaley, N. A., & Ferris, F. L., 3rd. (1992). Pars plana vitrectomy in the Early Treatment Diabetic Retinopathy Study. ETDRS report number 17. The Early Treatment Diabetic Retinopathy Study Research Group. Ophthalmology, 99(9), 1351-1357. doi:10.1016/s0161-6420(92)31779-8
2. Photocoagulation treatment of proliferative diabetic retinopathy. Clinical application of Diabetic Retinopathy Study (DRS) findings, DRS Report Number 8. The Diabetic Retinopathy Study Research Group. Ophthalmology. 1981;88(7):583-600.
3. Gross, J. G., Glassman, A. R., Jampol, L. M., Inusah, S., Aiello, L. P., Antoszyk, A. N., . . . Beck, R. W. (2015). Panretinal Photocoagulation vs Intravitreous Ranibizumab for Proliferative Diabetic Retinopathy: A Randomized Clinical Trial. Jama, 314(20), 2137-2146. doi:10.1001/jama.2015.15217
4. Machemer R, Buettner H, Norton EW, Parel JM. Vitrectomy: a pars plana approach. Transactions - American Academy of Ophthalmology and Otolaryngology American Academy of Ophthalmology and Otolaryngology. 1971;75(4):813-20.
5. The Diabetic Retinopathy Vitrectomy Study Research Group. Early vitrectomy for severe vitreous hemorrhage in diabetic retinopathy. Two-year results of a randomized trial. Diabetic Retinopathy Vitrectomy Study reports 2. Arch Ophthalmol. 1985;103:1644–52.
6. Oellers, P., & Mahmoud, T. H. (2016). Surgery for Proliferative Diabetic Retinopathy: New Tips and Tricks. Journal of ophthalmic & vision research, 11(1), 93–99. doi:10.4103/2008-322X.180697
7. Sharma, S., Hariprasad, S. M., & Mahmoud, T. H. (2014). Surgical management of proliferative diabetic retinopathy. Ophthalmic Surg Lasers Imaging Retina, 45(3), 188-193. doi:10.3928/23258160-20140505-01
8. Newman, D. K. (2010). Surgical management of the late complications of proliferative diabetic retinopathy. Eye (Lond), 24(3), 441-449. doi:10.1038/eye.2009.325
9. Gupta, V., & Arevalo, J. F. (2013). Surgical management of diabetic retinopathy. Middle East Afr J Ophthalmol, 20(4), 283-292. doi:10.4103/0974-9233.120003
10. O'Hanley, G. P., & Canny, C. L. B. (1985). Diabetic Dense Premacular Hemorrhage. Ophthalmology, 92(4), 507-511. doi:10.1016/s0161-6420(85)34014-9
11. Aaberg, T. M. (1981). Pars Plana Vitrectomy for Diabetic Traction Retinal Detachment. Ophthalmology, 88(7), 639-642. doi:10.1016/s0161-6420(81)34973-2
12. Jackson, T. L., Johnston, R. L., Donachie, P. H., Williamson, T. H., Sparrow, J. M., & Steel, D. H. (2016). The Royal College of Ophthalmologists' National Ophthalmology Database Study of Vitreoretinal Surgery: Report 6, Diabetic Vitrectomy. JAMA Ophthalmol, 134(1), 79-85. doi:10.1001/jamaophthalmol.2015.4587
13. Gupta, V., & Arevalo, J. F. (2013). Surgical management of diabetic retinopathy. Middle East Afr J Ophthalmol, 20(4), 283-292. doi:10.4103/0974-9233.120003
14. Gupta, B., Sivaprasad, S., Wong, R., Laidlaw, A., Jackson, T. L., McHugh, D., & Williamson, T. H. (2012). Visual and anatomical outcomes following vitrectomy for complications of diabetic retinopathy: the DRIVE UK study. Eye (Lond), 26(4), 510-516. doi:10.1038/eye.2011.321
15. Ostri, C., Lux, A., Lund-Andersen, H., & la Cour, M. (2014). Long-term results, prognostic factors and cataract surgery after diabetic vitrectomy: a 10-year follow-up study. Acta Ophthalmol, 92(6), 571-576. doi:10.1111/aos.12325
16. Abunajma, M. A., Al-Dhibi, H., Abboud, E. B., Al Zahrani, Y., Alharthi, E., Alkharashi, A., & Ghazi, N. G. (2016). The outcomes and prognostic factors of vitrectomy in chronic diabetic traction macular detachment. Clin Ophthalmol, 10, 1653-1661. doi:10.2147/opth.s98555
17. Dooley, I., Laviers, H., Papavasileiou, E., McKechnie, C., & Zambarakji, H. (2016). Spectral domain ocular coherence tomography findings pre- and post vitrectomy with fibrovascular membrane delamination for proliferative diabetic retinopathy. Eye (Lond), 30(1), 34-39. doi:10.1038/eye.2015.178
18. Shah, V. A., Brown, J. S., & Mahmoud, T. H. (2012). Correlation of outer retinal microstucture and foveal thickness with visual acuity after pars plana vitrectomy for complications of proliferative diabetic retinopathy. Retina, 32(9), 1775-1780. doi:10.1097/IAE.0b013e318255068a
19 . Schocket, L. S., Witkin, A. J., Fujimoto, J. G., Ko, T. H., Schuman, J. S., Rogers, A. H., . . . Duker, J. S. (2006). Ultrahigh-resolution optical coherence tomography in patients with decreased visual acuity after retinal detachment repair. Ophthalmology, 113(4), 666-672. doi:10.1016/j.ophtha.2006.01.003
20.Wolfensberger, T. J., & Gonvers, M. (2002). Optical coherence tomography in the evaluation of incomplete visual acuity recovery after macula-off retinal detachments. Graefes Arch Clin Exp Ophthalmol, 240(2), 85-89.
21. Kobayashi, M., Iwase, T., Yamamoto, K., Ra, E., Hirata, N., & Terasaki, H. (2019). Influence of submacular fluid on recovery of retinal function and structure after successful rhegmatogenous retinal reattachment. PLoS One, 14(7), e0218216. doi:10.1371/journal.pone.0218216
22. Tee, J. J., Veckeneer, M., & Laidlaw, D. A. (2016). Persistent subfoveolar fluid following retinal detachment surgery: an SD-OCT guided study on the incidence, aetiological associations, and natural history. Eye (Lond), 30(3), 481-487. doi:10.1038/eye.2015.270

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