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Rates of Reoperation and Retinal Detachment after Macular Hole Surgery

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Purpose: To evaluate rates of reoperation and retinal detachment (RD) after macular hole surgery.

Design: Retrospective cross-sectional study.

Participants: Patients in the insurance claim–based MarketScan databases from 2007 through 2013 with a record of macular hole surgery.

Methods: Patients with macular hole surgery were identified. Cases of definite (the same eye was coded both times) and presumed (the eye laterality was not coded) macular hole reoperations within 2, 3, and 12 months were queried. In addition, cases of postoperative RD within 2, 3, and 12 months were captured.

Main Outcome Measures: Rates of macular hole reoperation and postoperative RD, including subgroup analysis based on presence or absence of internal limiting membrane (ILM) peeling.

Results: Records of 23 465 macular hole surgeries among 20 764 patients were analyzed. Among presumed reoperations, the rates of reoperation were 4.3% (4.1% after ILM peeling and 5.0% after no ILM peeling; $P = 0.01$) within 2 months of surgery, 5.5% (5.3% after ILM peeling and 6.2% after no ILM peeling; $P = 0.03$) within 3 months of surgery, and 9.5% (9.0% after ILM peeling and 11.0% after no ILM peeling; $P = 0.01$) within 12 months of surgery. The rates for definite reoperations were 1.3% (1.2% after ILM peeling and 1.8% after no ILM peeling; $P = 0.04$) at 2 months, 1.7% (1.6% after ILM peeling and 2.5% after no ILM peeling; $P = 0.004$) at 3 months, and 4.1% (3.3% after ILM peeling and 7.5% after no ILM peeling; $P < 0.001$) at 12 months. The cumulative rate of postoperative RD was 1.81±0.09% to 2.18±0.5% after 2 months, 2.27±0.10% to 3.18±0.67% after 3 months, and 3.92±0.16% to 5.70±1.1% after 12 months. Internal limiting membrane peeling was associated negatively with postoperative RD at 2 months (2.3% vs. 1.7%; $P = 0.007$), 3 months (2.8% vs. 2.1%; $P = 0.004$), and 12 months (4.7% vs. 3.3%; $P < 0.001$).

Conclusions: In this sample, reoperations for macular hole were performed at low rates. Internal limiting membrane peeling was associated with lower rates of reoperation and RD. *Ophthalmology 2015;■:1–6 © 2015 by the American Academy of Ophthalmology.*

In 1991, Kelly and Wendel[1] published pars plana vitrectomy as a surgical treatment for macular holes and reported an initial anatomic success rate of 58%. Since then, surgical techniques have improved, with recent publications reporting primary closure rates of 84% to 100% (Table 1).[2–15] Macular hole surgery, as with any vitrectomy surgery, may be associated with several serious intraoperative and postoperative complications, including retinal tear, rhegmatogenous retinal detachment (RD), choroidal hemorrhage, cataract, optic neuropathy, ocular hypertension, cystoid macular edema, and endophthalmitis.[2,3,7–9,12,16–18] The incidence of RD after macular hole surgery has been reported to be as high as 17%.[3,7–23] The variability in these reported rates is most likely the result of variations in evolving surgical techniques and instrumentation, patient populations, surgical techniques, follow-up times, and sample sizes (Table 2). Most studies reporting postoperative RD rates have consisted of relatively small sample sizes (fewer than 1000 operated eyes).

Surgical techniques have evolved to include small-gauge surgery and internal limiting membrane (ILM) peeling. The purpose of this study was to assess the reoperation rates after macular hole surgery and also to evaluate the rates of postoperative RD using a large commercial insurance claim-based database.

Methods

Data Source

This was a retrospective, cross-sectional study using the MarketScan commercial Claims and Encounters and the Medicare Supplemental and Coordination of Benefit Outpatient Services (Truven Health Analytics, Ann Arbor, MI) from the years 2007 to 2013. The MarketScan family of databases comprises the largest convenience-based proprietary database in the United States, annually encompassing approximately 40 to 50 million patients with employer-sponsored or supplemental insurance. These databases consist of de-identified, individual-level health records (inpatient and outpatient) obtained from large employers, hospitals, and Medicare programs. Because the MarketScan databases contain de-identified and anonymized records and complies with the privacy requirements of the Health Information Portability and Accountability Act of 1996, institutional review board approval was not required.

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Table 1. Selected Previously Reported Primary Anatomic Closure Rates after Macular Hole Surgery

Authors	Year	Vitrectomy Technique	No. of Eyes	Primary Closure Rate (%)
Haritoglou et al[10]	2002	ILM peeling	99	87
Jaycock et al[11]	2005	ILM peeling	55	78
Lee et al[4]	2005	ILM peeling	37	91.9
Tognetto et al[8]	2006	ILM peeling, no ILM peeling	1100, 527	94.1, 89.0
Patelli et al[20]	2007	ILM peeling	24	100
Lai and Williams[5]	2007	ILM peeling	59	98
Muselier et al[2]	2010	ILM peeling	120	98.3
Passemard et al[16]	2010	ILM peeling	135	85
D'Souza et al[6]	2011	ILM peeling	491	88.8
Sakaguchi et al[7]	2012	No ILM peeling	23	95.7
Wu and Kung[21]	2012	ILM peeling	High myopia, 8; nonhigh myopia, 34	62.5, 94.1

ILM = internal limiting membrane.

The MarketScan Outpatient Services databases include demographic, provider type, and insurance information along with up to 4 diagnosis codes and 1 procedure code per recorded insurance claim (coded using the International Classification of Disease, 9th edition [ICD-9], and Current Procedural Terminology [CPT], respectively). Only 1 modifier (such as eye laterality or other modifiers, such as −79, "unrelated procedure (text deleted for space) during the postoperative period") is recorded per surgery. Further details regarding the structure and Health Information Portability and Accountability Act compliance of the MarketScan databases can be found elsewhere.[24] These databases have been used previously to study outcomes of other ophthalmic procedures.[25–28]

This search included both the MarketScan and Medicare claims databases. All patients in these databases have unique identifiers, which prevents the possibility of overlap (patients being counted twice).

Study Sample and Statistical Analysis

The present study used CPT codes and ICD-9 codes to identify all patients with macular hole surgery records (vitrectomy CPT codes: 67036, 67038, 67039, 67040, 67041, 67042, and 67043; accompanying ICD-9 code, 362.54). The 2-, 3-, and 12-month cumulative incidence rates of RD after macular hole surgery were calculated using only patients with 2, 3, and 12 months of continuous follow-up within the databases. The most likely explanation for a termination of follow-up within the databases is loss of health insurance. The databases were queried for cataract extraction CPT codes 66850, 66982, 66983, and 66984 recorded on the same day as macular hole surgeries to identify instances of combined surgeries. Retinal detachment cases were queried using ICD-9 codes 361.00 through 361.05 and 361.81.

Because some records did not designate the operated eye, 2 approaches were used to evaluate the proportion of reoperations after the initial macular hole surgery. The first approach (presumed reoperations) included all macular hole surgeries regardless of whether the eye laterality was recorded. This analysis assumed that any macular hole operation using the same CPT and ICD-9 codes within 2, 3, or 12 months of an original surgery was a reoperation on the same eye. The second approach (definite reoperations) included the subset of presumed cases in which the surgical record that

Table 2. Selected Previously Reported Retinal Detachment Rates after Macular Hole Surgery

Authors	Year	Vitrectomy Technique	No. of Eyes	Follow-up (mos)	Retinal Detachment Rate (%)
Park et al[22]	1995	ERM removal	98	11 (mean)	14
Banker et al[18]	1997	No ILM peeling	95	12	11
Tabandeh et al[19]	1999	ERM peeling, no ILM peeling	438	30 (mean)	1.8
Brooks[9]	2000	ILM peeling, no ILM peeling	116, 44	44.5 (mean)	2.7, 4.5
Haritoglou et al[10]	2002	ILM peeling	99	32 (mean)	2
Ezra et al[23]	2004	ERM peeling, no ILM peeling	124	24	5.6
Kwok et al[13]	2005	ILM peeling, no ILM peeling	26, 25	12 (mean)	7.7, 4
Tognetto et al[8]	2006	ILM peeling, no ILM peeling	1100, 527	15 (median)	2.3, 2.9
Guillaubey et al[12]	2007	ILM peeling	272	28 (mean)	6.6
Patelli et al[20]	2007	ILM peeling	24	10 (mean)	16.6
Christenen[14]	2009	ILM peeling, non-ILM peeling	54, 25	12	2.2
Rizzo et al[17]	2010	ILM peeling in all cases; 20 gauge or 23/25 sutureless	301, 656	6	1.2, 1.7
Passemard et al[16]	2010	ILM peeling	135	37 (mean)	7.4
Lois et al[15]	2011	ILM peeling, non-ILM peeling	64, 62	6	5, 3
Sakaguchi et al[7]	2012	No ILM peeling	23	83.4 (mean)	0
Wu and Kung[21]	2012	ILM peeling	High myopia, 8; non-high myopia, 34	7.0 (mean), 8.12 (mean)	12.5, 0
Jackson et al[3]	2013	ILM peeling, non-ILM peeling	1014, 64	Unspecified	2.4 (RD surgery)

ERM = epiretinal membrane; ILM = internal limiting membrane; RD = retinal detachment.