MANAGEMENT OF RHEGMATOGENOUS RETINAL DETACHMENT WITH MACULAR HOLE

The prevalence of macular hole (MH) coexistent with rhegmatogenous retinal detachment (RRD) with peripheral break (RRD-MH) is thought to be 2% to 8%, depending on the study.\(^1,2\) However, some have postulated that macular holes may go undetected upon initial evaluation of a patient with RRD and that the real prevalence of RRD-MH may actually be on the high end of the reported spectrum in macula-off retinal detachment (RD).

There is no consensus as to the preferred treatment for this clinical scenario. This review serves to elucidate some general principles in the management of this complex condition.

**PATHOPHYSIOLOGY**

Is RRD-MH associated with proliferative vitreoretinopathy (PVR)? The pathophysiology of MH in RRD is not entirely clear, but one hypothesis is that retinal pigment epithelium (RPE) cells released from a peripheral break attach to the macular surface, contract, create tangential traction, and cause an MH, as in a PVR process.\(^1\)

Another theory is that a posterior vitreous detachment, in addition to causing a peripheral break, may put tangential traction on the central macula, leading to an MH.\(^2\)

In a retrospective study including 16 patients with RRD-MH, Najafi et al reported that 18% of the patients developed an RD in the fellow eye,\(^1\) an incidence slightly higher than the incidence of RD in the general population, of 2% to 11%.\(^1\)

It is possible that patients with RRD-MH may have underlying vitreoretinal interface abnormalities that predispose to RRD and MH. Also, nine of the 16 eyes (53%) in the Najafi et al study had coexisting PVR. Along these lines, Cunningham et al reviewed 607 patients who underwent surgical repair for RRD and found that MH was present in 7.3% of cases of RRD with PVR, but only 1.4% of cases of RD without PVR.\(^2\) This finding suggested that, in the setting of RRD, MH and PVR may be significantly associated.

**MANAGEMENT: SURGICAL STRATEGIES**

The original strategy for repair of RRD-MH was to repair the RRD by creating adhesion of the peripheral breaks and to disregard the MH, as leaving the MH open rarely prevents RRD from reattaching.\(^3,4\) However, Ah Kiné

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**AT A GLANCE**

- MH with RRD can present a complex surgical challenge, and no best practice patterns have been defined.
- It is feasible in most cases to peel ILM over detached retina using a pinch-and-peel technique. However, it may not be required for most MHs to close in the setting of RD.
- If peeling is performed, care should be taken to prevent subretinal migration of the staining agent and enlargement of the MH.
- Generally, high rates of MH closure and retinal reattachment can be achieved.
CASE EXAMPLES
By Lianna Valdes, MD; Patrick Oellers, MD; and John B. Miller, MD

Case No. 1
A 60-year-old patient presented with dialysis retinal detachment and associated macular hole (MH). He related a history of significant blunt trauma a few years earlier. There was a pigmented demarcation line associated with the dialysis, which was broken through with subretinal fluid on presentation. The patient underwent 25-gauge pars plana vitrectomy, scleral buckle, and internal limiting membrane (ILM) peeling aided by indocyanine green staining and C3F8 gas. The ILM was peeled using a pinch-and-peel technique with end-grasping forceps (Figure A, B). A broad sheet of ILM was then peeled across the MH (C) without causing any enlargement of the MH. At 9 months postoperative, the retina remains attached with closed MH and VA of 20/40 (D, E).

Case No. 2
A 53-year-old patient presented with total retinal detachment with MH. He had previous laser demarcation performed outside the country (Figure A, B). The patient underwent 23-gauge pars plana vitrectomy, scleral buckle, and ILM peel assisted with indocyanine green staining and C3F8 gas. At 3 months postoperative, his retina was attached with closed MH. BCVA was 20/25 (C).
et al showed that closure of MH signi-
nificantly improves final BCVA.1

With the goal of repairing the
MH as well as the RRD in mind, two
approaches can be taken. In a sequen-
tial approach, only the RRD repair is
addressed in primary surgery, and after
the retina is attached, a second surgery
is performed to repair the MH if need-
ed. In a combined approach, the RRD
and MH are both addressed in one
surgery with internal limiting mem-
brane (ILM) peeling over the macula.

Subretinal fluid can be drained
through the MH, a peripheral break,
or a posterior retinotomy. What is the
best route to use? In a study in which
fluid was drained through a posterior
retinotomy, the MH closure rate was
87%.5 In two studies in which fluid was
drained through a peripheral break,
the closure rate was 100%.3,6 In two
studies in which fluid was drained
through the MH, the closure rate vari-
ed greatly, at 30% and 91%.4,7

Drainage of subretinal fluid through
the MH may enlarge the hole and
disrupt photoreceptors and RPE cells.
As a result, this approach may be asso-
ciated with worse VA outcomes and
closure rate, so we advise against it.

TO PEEL OR NOT TO PEEL?

In theory, peeling the ILM in surgery
for RRD-MH can improve surgical
outcomes by removing any remaining
tractional forces across the macula. In
49 cases of surgical repair of RRD-MH
included in one study, 39 of 43 (90.7%)
holes closed with ILM peeling, com-
pared with only two of six (33.3%)
closing without ILM peeling.7 This find-
ing suggests that ILM peeling increases
the chance of MH closure in the set-
ting of concurrent RD. However, with
only six cases in which ILM was not
peeled, the small sample size limits the
strength of any statistical conclusion.

In a retrospective analysis of
10 patients by Ah Kiné et al,8 all MHs
closed without ILM peeling. In a pro-
spective study, Shukla et al separated
patients undergoing RRD-MH repair
into two groups: One underwent ILM
peeling, and the other did not.5 In this
study, 14 of 17 of the MHs treated
with ILM peeling closed, compared
with 13 of 14 of the MHs treated with-
out ILM peeling. Of note, ILM peel-
ing in this study was associated with
worse final VA.

Overall, ILM peeling does not seem
to be mandatory. Peeling the ILM in
the setting of RD can be technically
challenging, as the detached retina
gives way in the direction of the peel-
ing. Also, because of a lack of counter-
traction, a pinch-and-peel technique is
usually required, and flap creation with
diamond-dusted membrane scraper
(multiple vendors) or Finesse Flex Loop
(Grieshaber/Alcon) does generally not
work well over detached retina.

Care must be taken not to enlarge
the macular hole during membrane
peeling. Use of perfluorocarbon liquid
(perfluoro-n-octane, PFO) to provide
countertraction has been suggested by
several authors. However, this may
have its own associated difficulties,
as there is a risk for subretinal reten-
tion of PFO and because PFO flat-
tens elevated ILM flaps toward the
retinal surface.

In a recently introduced technique,
Chirag D. Jhaveri, MD, suggests that a
PFO “marble,” 1 to 2 disc areas in size,
can be used to provide countertrac-
tion, can allow manipulation of the
flap under balanced saline solution,
and can be more easily kept away
from the MH.8

Staining agents may be used, but
they must be kept from going to the
subretinal space. In this regard, indo-
cyanine green (ICG) dye can be toxic
to the retina and RPE with high con-
centrations or prolonged exposure. It
is likely that brilliant blue G dye has a
better safety profile, but no formula-
tion approved by the FDA is available,
and it cannot be easily obtained by all
retina specialists in the United States.

We believe that ILM peeling is
feasible in most cases without the use
of PFO. We prefer a pinch-and-peel
technique, with cautious staining using
ICG or brilliant blue G. However, in
cases in which ILM peeling is techni
cally challenging, for example due to poor
surgical view or a bullous nature of the
macular detachment, it is often advan-
tageous to prioritize the surgical steps
to repair the RRD without peeling of
the ILM, given the high closure rate of
MH in RRD even without ILM peeling.

WITH COEXISTING PVR

There is a high prevalence of PVR
in RRD-MH, and we recommend
aggressive surgical treatment overall,
with possible consideration of add-
ing an encircling scleral buckle. In
cases with definite PVR present, we
believe that ILM peeling can have an
added benefit to MH closure. In these
cases, the edges of peeled ILM can be
peeled further toward the periphery to
remove concurrent PVR membranes
and thereby remove any scaffold for
PVR regrowth.

We believe that C3F8 gas is favor-
able over silicone oil in most cases,
due to a higher likelihood of MH
closure. As for any MH cases in gen-
eral, optimal gas fill is desired. We
usually reserve silicone oil for patients
who need a large peripheral relaxing
retinectomy or in selected cases for
patients who are unable to maintain
facedown positioning.

CONCLUSION

RRD-MH can present a complex
surgical challenge, and no best prac-
tice patterns have been defined.
There is no strong evidence in favor
of ILM peeling, but, when peeling is
performed, care should be taken to
prevent subretinal migration of the
staining agent—especially ICG—and
enlargement of the MH.

There seems to be an association
of RRD-MH with PVR, and we rec-
ommend a low threshold for surgical
strategies to treat PVR such as
scleral buckle and membrane peeling.
Generally, high rates of MH closure
and retinal reattachment can be
achieved. As always, the best strategies depend on the individual surgeon’s experience and the specific parameters of the case (see Case Examples). ■


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