A successful approach to vertebrobasilar aneurysms

Technical note

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The authors present a surgical technique for approaching vertebrobasilar area aneurysms. The dural and clival defect is obliterated by means of a live vascularized muscle flap. A regimen of antimicrobial prophylaxis is described.

KEY WORDS • vertebrobasilar aneurysm • transclival approach • transoral approach • antimicrobial prophylaxis

Posterior approaches to aneurysms of the middle and lower third of the basilar artery and intracranial vertebral arteries ventral to the brain stem are often indirect and treacherous. In these techniques, dissection traverses lower cranial nerves, affording lateral glimpses at a variably placed aneurysm dome or neck, and often requires medullary retraction. The transoral-transclival approach is more logical anatomically, and its benefits and drawbacks have been described by numerous surgeons.1,2,4-6,10

The complications reported in the transoral-transclival approach have included infection, cerebrospinal fluid (CSF) leak, pseudomeningocele of the clival pharynx, and incision of the dura that may be subadjacent or attached to the aneurysm dome.

We have successfully ligated an aneurysm at the vertebrobasilar junction and repeated the procedure within a week when angiography revealed that the clip had slipped from the aneurysm neck. Using the operative technique described below, we left the dura wide open. There was no need for postoperative CSF drainage.

Case Report

This 47-year-old alcoholic woman was admitted with sudden syncope, seizure, and coma. She subsequently improved without signs of neurological dysfunction except for slight blurring at the optic disc margin.

Examination. She had xanthochromic CSF, but a normal computerized tomography (CT) scan. Four-vessel cerebral angiography demonstrated an aneurysm to the right of the basilar artery origin and a rudimentary right vertebral artery. A second aneurysm was also seen at the right middle cerebral artery trifurcation. We were encouraged to treat the basilar aneurysm initially because of its teated appearance and the absence of neurological lateralization and of Sylvian hemorrhage on the CT scan, and because of the high mortality associated with late basilar aneurysm rebleeding.7

Antimicrobial Prophylaxis. Before antimicrobial therapy, cultures of the throat and nasopharynx yielded normal flora. Two days before surgery, a regimen of gargling with half-strength hydrogen peroxide every 6 hours was begun. In addition, nasal drops consisting of neomycin (1 mg/cc) and bacitracin (500 units/cc) were administered to each nostril every 4 hours. Twelve hours prior to surgery, nystatin liquid, 500,000 units, was swished, gargled, and swallowed every 2 hours. Eight hours prior to surgery, intravenous courses of nafcillin and chloramphenicol were begun, 200 mg/kg and 75 mg/kg, respectively,
at 6-hour intervals and continued during and after surgery. Postoperatively, 50% povidone-iodine in saline solution and nystatin were given by nasal drops, each every 4 hours. The half-strength hydrogen peroxide gargle every 6 hours was continued. These medications were continued for approximately 60 hours postoperatively. There was a 60-hour period between the first and second operations, during which all antibiotics, gaggles, and drops were withheld.

Twelve hours before the second procedure, povidone-iodine and nystatin nasal drops were begun as with the first operation. The nafcillin and chloramphenicol were restarted 8 hours before surgery, as before, and continued intravenously for 48 hours postoperatively. In addition, the nystatin, povidone-iodine, and hydrogen peroxide were continued 96 hours postoperatively in regimens similar to those outlined above.

**Operations.** The first surgical procedure was performed after anesthetic induction and insertion of a tracheotomy tube. With the patient’s head extended in the supine position, the face, oropharynx, and mouth were prepared. The mouth was held open and tongue depressed with a McIvor gag and tongue retractor. One percent xylocaine with epinephrine was injected subperiostally into the hard palate and the midline soft palate. Figure 1 depicts the main steps in

**FIG. 1.** *Upper:* The hard palate mucosa with soft palate and uvula are split in the midline and retracted laterally. The distal half of the pharyngeal flap mucosa had been excised from underlying muscle in a V-shape. *Lower Left:* A free vascularized flap of pharyngeal constrictor muscle is ready for insertion into the clival-atlas defect (*dotted lines*). *Lower Right:* The muscle flap fills the bone-dural defect with V-plasty mucosal closure.
the procedure. A bilateral incision was begun poste-
riorly at the tuberosity of the alveolar ridge and
continued around the alveolus to the midline, ante-
orly avoiding the incisive foramen. The soft palate
was divided in the midline with a free-hand carbon-
dioxide surgical laser in a continuous mode, to the
hard palate notch. The mucosa and periosteum were
stripped from the hard palate and posterior alveolar
ridges bilaterally. This allowed upward retraction of
the soft palate and preserved the posterior palatine
artery and vein in these flaps, allowing visualization
of the posterior pharynx. A rectangular posterior pha-
ryngeal flap of the mucosa and superior constrictor
muscles was based superiority at the posterior choanae,
not encroaching upon the eustachian orifices, and
incised to the underlying fascia. The inferior aspect of
this flap was located at C2-3 and localized with the
aid of a C-arm image intensifier. A suture was at-
tached to the distal pharyngeal flap and brought out
through the nose for upward retraction.
Following this retraction, the superior pharyngeal
musculature, including the longus capitis, rectus cap-
itis anterior, and longus colli was retracted laterally
with an articulated Weitlaner retractor. The anterior
atlanto-occipital ligament and membrane were incised
in the midline, and elevated laterally. The anterior
rim of the foramen magnum was identified using the
C-arm image intensifier. Under the operating micro-
scope, the clivus was removed between the occipital
condyles to the level of the pharyngeal tubercle, using
a rotating diamond surgical burr and a long-angled
handpiece. The deep limit of this portion of the dis-
section was the dense ligamentous sling composed of
the apical dental ligament, superior crus of the trans-
verse ligament, and tectorial membrane, exposing the
ventral dura. The apical, dental, and crural ligaments
are intimately part of the dura. The dura was incised
well away from the expected aneurysmal site supe-
riorly and opened in a cruciate fashion, using a curved
knife blade. After the basilar artery was identified,
dissection and resection of the dura and overlying
vascularized tissue was carried down to the superior
arch of C-1 away from the aneurysm. Evidence of
recent hemorrhage was noted, but no clot was en-
countered. The aneurysm dome was found to be
attached to the dura and was not dissected free. A
short aneurysm neck was probed and freed with a
blunt nerve hook and a Scoville clip was applied. No
attempt was made to close the dura.
In closure, the flap of posterior pharyngeal mucosa
and muscle was released from retraction into the
posterior pharynx, and the distal half of the mucosa
trimmed from the edge in a V-shaped fashion. The
underlying flap of exposed superior constrictor muscle
was turned under and used to plug the defects in the
bone and dura, and the V-flap of mucosa and muscle
was sutured to the lateral walls of mucosa and muscle
with vertical mattress 2-O chromic gut sutures forming
a Y-shaped, watertight closure. The palate was reop-
posed routinely.
The patient enjoyed an uneventful afebrile post-
operative course, except for isolated left hemiparesis
with facial sparing. A repeat angiogram revealed that
the clip had slipped from the aneurysm neck.
Six days after the first operation, the same proce-
dure of retraction and palate splitting was accom-
plished. The pharyngeal flap was viable but edema-
tous, and was retracted as before. The Scoville clip
lay free superior to the aneurysm and was removed.
In order to visualize both vertebral arteries more
adequately, about 3.0 mm was rongeured from the
top of the atlas, sparing the dens, and the dura was
incised and excised more widely allowing access to
both vertebral arteries. The neck of the aneurysm was
once again mobilized and a straight Heifetz clip was
applied over the neck of the aneurysm, including the
rudimentary right vertebral artery as it joined the
other vertebral artery. The basilar artery was not
compromised and the closure was once again accom-
plished. The residual superior constrictor muscle flap
was not adequate this time to fill the clivodural defect.
Therefore, portions of the palatopharyngeal and some
middle constrictor muscles on either side of the defect
were mobilized and inferiorly sectioned. These muscle
flaps were rotated upward and used to fill the clival
cavity, intersecting the midline, being of sufficient
length for this purpose. The superiorly based mucosal
flap was then returned to its position over the muscles
and sutured to the surrounding fascia with 3-0
chromic gut. The remainder of the closure was accom-
plished as before.
Postoperative Course. The postoperative course was
uneventful, with gradual clearing of the left hemi-
paresis which was more profound proximally. The
patient swallowed liquids a day or two postopera-
tively, remained afebrile, and phonated normally
when the tracheotomy tube was removed.
Discussion
We suggest that the successful outcome of this
transoral-transclival approach resulted in large part
from the insertion of fully vascularized, live muscle
into the defect in the bone and dura without burying
suture, plastics, or autografts in the depths of this
opening. We believe that this living flap of tissue
sealed the dural opening, preventing CSF leak, and within hours formed a barrier against central nervous system infection. The integrity of the pharyngeal wall was maintained with the live muscle graft and prevented a pseudomeningocele bulge and attendant dysphagia, without resorting to postoperative CSF draining. Extension of the mucosal flap onto the hard palate was mandated by inadequate posterior pharyngeal exposure with the soft palate bisection alone. The posterior pharyngeal flap extended as low as C2–3 to allow adequate length and mass of the muscle graft. Visualization of both vertebral arteries, allowing the potential for temporary control, was gained by shaving a few millimeters from the top of the anterior atlas and by wider dural incision and coagulation. The anatomically traditional location of the pontomedullary junction one-third of the way up the clivus was found lower, just above the anterior rim of the foramen magnum in our dissection, with the vertebral arteries joining to form the basilar above the anterior arch of the atlas.

We chose an empiric regimen of wide-spectrum topical and systemic prophylactic antimicrobial therapy to cover those organisms thought to be potentially pathogenic in this situation. The use of prophylactic antibiotics in neurological surgery has not been clearly established, and some authors believe them to be not only ineffective but possibly harmful. Our patient showed no sign of infection. The early postoperative swallowing of fluids, lack of nasogastric tube insertion, and antimicrobial prophylaxis probably played a significant role in her lack of sequelae.

Use of the laser in sectioning the palate minimized edema and tissue damage with suitable hemostasis. The C-arm image intensifier assisted in the location of the pharyngeal flap by allowing immediate visualization of underlying bone structures.

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References


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