PREMATURE SYNOSTOSIS OF THE SAGITTAL SUTURE
AND ITS TREATMENT

A MODIFICATION OF THE LINEAR CRANIECTOMY AND THE USE OF
SYNTHETIC FABRICS

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Craniostenosis, a term introduced by Virchow in 1851, applied to the premature closure of one
or several cranial sutures. Of the 37 sutures of the cranium, the 4 long ones, sagittal, coronal, lamb-
doidal and squamosal, in order of sequence, are
the most frequently involved. The premature ossification
of the sagittal suture creates scaphocephaly. For the correction of this deformity, many surgical procedures have been described. Faber and Towne removed a strip of bone about
2 cm. wide adjacent to the prematurely closed
suture. Because of the fact that the linear craniec-
tomy tends to close in a short time of 4 to 8
months, various materials designed to prevent fusion have been reported. Among these, polyethylene sheet, introduced by Ingraham et al. and McLaurin and Matson, is the most commonly used. The above authors advocated a
bilateral parasagittal craniectomy instead of a
unilateral one. For the prevention of new-bone
formation from the endosteum, Anderson and
Johnson painted the outer surface of the dura
mater with iodine or Zenker’s solution. In older
children with scaphocephaly, extensive proce-
dures such as bilateral large craniotomy bone flap,
moulding flap, four-flap technic, “football-field”
pattern of craniectomy, and “top-lifting” circular
 craniotomy have been developed. King
recommended craniectomy for severe types of
craniostenosis.

The present communication concerns a modifi-
cation of the unilateral parasagittal craniectomy performed in 8 cases of scaphocephaly. For the prevention of early fusion of the craniectomy, synthetic cloth, Vinyon “N” and Teflon, have been used. The advantages of using this modified simple technic and the results, with a
follow-up of 2 to 6 years, are presented in the
following.

MATERIAL AND METHOD

Of the 8 children, 6 were male and 2 were
female. At the time of operation, their ages varied
from 2 to 9 months. Five were under the age of 6
months (Table 1).

The operation consisted of a linear craniectomy performed under ½ per cent procaine local infiltration of the scalp, supplemented with whisky and sugar by mouth. The skin incision was midline over the synos-
totic sagittal ridge. The bone incision was right para-
sagittal 1½ cm. from the midline and about 1 cm. wide. The craniectomy was carried anteriorly beyond the

TABLE 1
8 cases of premature closure of the sagittal suture

<table>
<thead>
<tr>
<th>No.</th>
<th>Sex</th>
<th>Age at Operation (months)</th>
<th>Anesthesia Used</th>
<th>Synthetic Material</th>
<th>Duration of Follow-up (yrs.)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>7</td>
<td>Intratracheal ether</td>
<td>Vinyon “N”</td>
<td>6½</td>
<td>Optimal</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>9</td>
<td>Intratracheal ether</td>
<td>Vinyon “N”</td>
<td>6½</td>
<td>Suboptimal</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>2</td>
<td>Local*</td>
<td>Vinyon “N”</td>
<td>5</td>
<td>Optimal</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>8</td>
<td>Intratracheal ether</td>
<td>Vinyon “N”</td>
<td>14½</td>
<td>Optimal</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>5</td>
<td>Local</td>
<td>Vinyon “N”</td>
<td>14½</td>
<td>Optimal</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>3</td>
<td>Local</td>
<td>Teflon</td>
<td>2½</td>
<td>Optimal</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>2</td>
<td>Local</td>
<td>Teflon</td>
<td>1½</td>
<td>Suboptimal</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>2½</td>
<td>Local</td>
<td>Teflon</td>
<td>1½</td>
<td>Suboptimal</td>
</tr>
</tbody>
</table>

* Procaine ½ per cent supplemented with whisky and sugar by mouth.
† Normal appearance of skull.
‡ Narrow occiput and somewhat pointed.
coronal suture, cross the midline, and to the left along the coronal suture, instead of extending straight into the frontal bone as described by other authors. Thus, an artificial anterior fontanelle was created. Posteriorly, the incision passed behind the lambdoidal suture and extended laterally with reopening of the posterior fontanelle (Fig. 1). A strip of synthetic cloth, Vinyon “N”, or Teflon, 1½ inches in width and the total length of the bone incision, was used to wedge between the edges. The outer half of the cloth was tucked between the bone and the periosteum-dura mater, and the inner half of the cloth was buried between the galea aponeurotica and the pericranium (Fig. 2, I). The skin and galea were closed separately. Cotton-padded dressing was applied.

The synthetic cloths used were 2 kinds, Vinyon “N” and Teflon.* Vinyon “N” is not available and it has been out of production because of lack of commercial value, in spite of the fact both animal and clinical experiments have shown its comparative inertness when buried in tissues.

The Teflon cloth was woven like silk, soft, flexible and coffee-colored (unbleached). It has a waxy surface. It stands heat, wet or dry, 350°–400° F., un changed. It has been autoclaved repeatedly at 270° F. under 30 lbs. pressure for 5–10 min. without any noticeable alteration of its property. It is chemically inert, like Vinyon “N.”*  


Fig. 1. Diagram showing synostotic ridge (S), normal coronal suture (C), lambdoidal suture (I), and “Z”-shaped craniectomy (B).

Fig. 2. (I) Method of application of synthetic fabric, Vinyon “N” or Teflon, indicated by line of crosses (D). Synostotic ridge (S). Falx (F). Skin (1), pericranium (2), cranium (3) and dura mater (4). (II) “T”-shaped bone-bridge formation fused the craniectomy in edge-wrapping technic. Wrapping material (P) and bone bridge (B). (III) Hinge form bone bridge following present technic of craniectomy and wedging placement of synthetic fabric. It takes a wide projection of new bone across the cloth to produce a firm fusion of the craniectomy. Synthetic cloth (D). Bone hinge (B).

and incites minimal reaction when buried in tissues or used as dural substitute. Teflon has been used extensively in cardiovascular surgery.

Vinyon “N” cloth was used in 6 and Teflon in 2 patients of this report.

OBSERVATIONS AND RESULTS
From 1956 to 1961, a total of 36,940 live infants were delivered at the Kaiser Foundation Hospitals and among these, there were 8 with premature synostosis of the sagittal suture. In all 8 patients, a synostotic ridge over the closed sagittal suture was visible and palpable, and radiologically demonstrable. The coronal and lambdoidal sutures were open, but both the anterior and posterior fontanelles were obliterated. The shape of the skull was scaphoid in all 8 instances. By measurement and observation, microcephaly was not present in any of these cases. In 3 infants, the scaphocephaly was first noted when they were