EVALUATION OF SUBCUTANEOUS CARTILAGE AUTOGRRAFTS – AN EXPERIMENTAL STUDY

V. Anand • Rajamma Rajan

Cartilage is a useful graft material especially in facial reconstructive procedures. Doubts have been expressed regarding their viability and ability to retain the original shape in the long term. In our study spanning over a period of 6 to 16 months, 36 autografts cartilage grafts suitably tagged were implanted in subcutaneous pockets of rabbits. Special care was taken to prevent the grafts lying in contact with the incision wound. At the end of the study period the grafts were assessed for change of shape and studied histologically.

In this series the recovery rate was 83.3% with all the recovery grafts being found viable histologically. Hence cartilage is a useful graft in subcutaneous planes, especially when placed away from the incision line. Alteration in the shape of the graft was noticed in 50% of the grafts in our series. Factors leading to the change of shape are discussed.

The quest for an ideal implant material in facial plastic surgery has been going on for the past 80 years, Young (1941), Craigmyle (1955), McGlynn (1981). Cartilage in its homologous or autologous form is a particularly useful graft material of minimal antigenicity, Craigmyle (1955). The purpose of this study was to assess the ability of autograft cartilage to retain the original shape and maintenance of viability in subcutaneous planes.

Stored homograft cartilage has no viable chondrocytes which elaborate the ground substance. In autografts, as the chondrocytes are viable the graft has a better chance of retaining the original form in the long term. Fresh autologous cartilage is readily available from the pinna, septum and ribs, use of which avoids the risk and care necessary for homograft storage, McGlynn (1981).

Materials and Methods
Eighteen one to one and a half years old New-Zealand white rabbits of both sexes were used for this study. Anaesthesia was induced with Thiopentone 30 mg/Kg intravenously. Local infiltration of Lignocaine 1% with 1 in 200000 Adrenaline was used as supplement.

From the donor area of anterior aspect of auris cartilage was removed, stripped of its perichondrium and
Evaluation of Subcutaneous Cartilage Autografts – An Experimental Study — Anand & Rajan

divided into two pieces measuring 15 x 5 mm. Tagging of grafts was done with 5-0 prolene sutures.

A midline incision was made in the chest wall and lateral pockets were developed by dissecting in the subcutaneous plane superficial to the muscle. Care was taken to place the graft and the marking suture more than a cm away from the incision line so that no contact can occur with the wound site, (Fig 1). Skin closure was done with 3-0 silk. The total number of grafts placed was 36.

The study period extended between 6-16 months with an average duration of 12 months. Upon reopening the macroscopic appearance of the grafts were noted and the grafts were subjected to histopathological study.

Results

A total of 30 grafts out of the 36 placed were recovered making a recovery rate of 83.3%. In two animals both the graft pairs were lost and in two others one graft each was not traceable. In all these the recipient site was found to be fibrosed. Another significant finding was the non absorbable marking sutures of the lost grafts could not also be recovered from the recipient site.

Of the 30 recovered grafts all had their marking sutures in place. The fibrosis in the recipient beds of these grafts were minimal and the grafts were dissected out without much difficulty. 50% of the recovered grafts showed alteration from their original shape especially twisting in their long axis. The results of histopathological study are given in table 1.

Discussion

The graft recovery rate of 83.3% in our series is more than of similar studies done by Eissemann (1983). The technique of graft implantation adopted, places the graft away from the skin incision which minimised the chances of the graft getting enmeshed in the skin scar (Fig 1). The large graft size and the contrasting blue of the prolene marking sutures helped in easy identification and recovery. In an intramuscular auto-cartilage implantation study Eissemann (1983), used 8.0 nylon to tag the grafts. Further stay sutures of 6.0 nylon were brought out to the skin surface and tied to prevent migration of the grafts. With a study period of 90 days his graft recovery rate was 73.5%. The subcutaneous graft placed in the relatively avascular facial planes will take longer to derive nutritional support from the host, in contrast to the intramuscular host bed. The recovery rate despite this factor was higher with the subcutaneous grafts which is due to the method of placement and buried tagging sutures. Presence of blood clots in the vicinity of autograft cartilage is harmful for the viability of chondrocytes, Gibson (1976). Coapting the graft to the host bed is necessary to prevent a dead space and blood clot. As there were no large vessels in the host bed area and the elasticity of the overlying dermis obliterated the space created this problem was not encountered.

It is of significance that the non absorbable marking prolene was missing in 6 grafts that could not be recovered. Such losses can only occur with extrusion and not by resorption of cartilage as described by Leslie Bernstein (1983). The most likely initiating factor for extrusion is post operative infection. Surface fibrosis was demonstrated histologically in 12 out of 30 grafts. An irregular fibrosis can lead on to a change of shape of the graft by toisional twisting. The form of the cartilage is further maintained by a mechanism of interlocked stress which is balanced, Gibson (1958).

Table 1

<table>
<thead>
<tr>
<th>Histological features</th>
<th>No</th>
<th>Percentage of grafts Showing the features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viable with chondrocytes (Fig 2)</td>
<td>30</td>
<td>83.3%</td>
</tr>
<tr>
<td>Non viable with total absence of cells</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Areas of hyalinisation of cartilage</td>
<td>3</td>
<td>8.3%</td>
</tr>
<tr>
<td>Surface fibrosis (Fig 3)</td>
<td>12</td>
<td>33.3%</td>
</tr>
<tr>
<td>Patchy Ossification (Fig 4)</td>
<td>3</td>
<td>8.3%</td>
</tr>
</tbody>
</table>

Note: The percentage in the 3rd column exceeds 100 as the appearances are noticed in different sections of the same graft.

Fig. 2. Recovered viable graft. (H & E, X 100)