Myringoplasty

The lessons of failure

By J. B. Booth (London)

This is the final paper in a series which have been devoted to analysing the results of myringoplasty and tympanoplasty operations. Hitherto only the successes have been reported but there have also been failures; this paper attempts to see what lessons can be learnt from the latter. In the second paper (Booth, 1973) presenting the results of the myringoplasty cases (Final Report), 517 results were analysed (Attended Series 292; Series X 225). Since then a further thirty-one case notes have been located and these are included in this analysis. Of these thirty-one, one patient also underwent an intact canal-wall mastoidectomy for a discharging ear; two patients had re-operations after a single previous attempt and two patients had a 'dead ear' prior to operation. Of the total of 548 cases, who underwent a repair by one of the eight methods examined only one patient received a 'dead ear'. Eleven of the additional thirty-one cases failed to complete a six-month follow-up.

Of the 195 myringoplasty failures, twenty-four had undergone previous surgery. In addition to the myringoplasty failures there were also twenty-three tympanoplasty failures, of whom three had undergone a previous attempt. The total Attended Series has therefore been 392:

Myringoplasty	292
Tympanoplasty (types II and III)	100

The total Series X has been:

Myringoplasty	256
Tympanoplasty (types II and III)	53

The total failures have been:

Myringoplasty	195
Tympanoplasty (types II and III)	23

Included more than once in the annual statistics of the hospital will be those patients who were re-operated (ninety-one—not all of whom had their earlier surgery here) and those who had undergone staged reconstructions (sixteen). A total of 1,104 operations are therefore accounted for. In addition the records of a further 482 cases were inspected and excluded

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(Appendix). If these totals are compared with those published in graphic form (Booth, 1972), an obvious discrepancy will be noted—myringoplasty 1,368 cases, tympanoplasty 388 cases. However, no amount of searching revealed all the records requested.

Reference to Figures 1 and 2 and comparison with the aforementioned figure (Booth, 1972; Fig. 1) will show that in respect of the myringoplasty

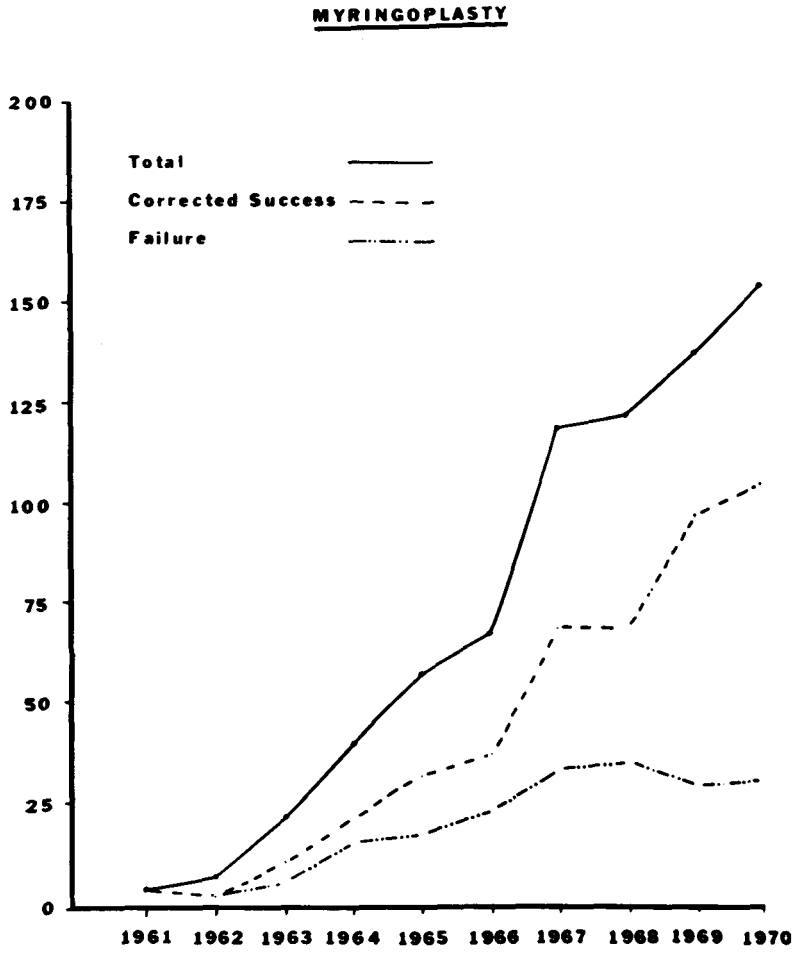


FIG. 1.

cases a similar trend is demonstrated (an increasing number of operations each year). By contrast, almost all the early tympanoplasty cases were associated with the formation of a mastoid cavity and in these surveys have been classified as 'mastoidectomies' and thereby omitted. Figures 1 and 2

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show the total number of operations of each type (myringoplasty and tympanoplasty respectively) together with the corrected success and failure rates according to the year in which they were performed.

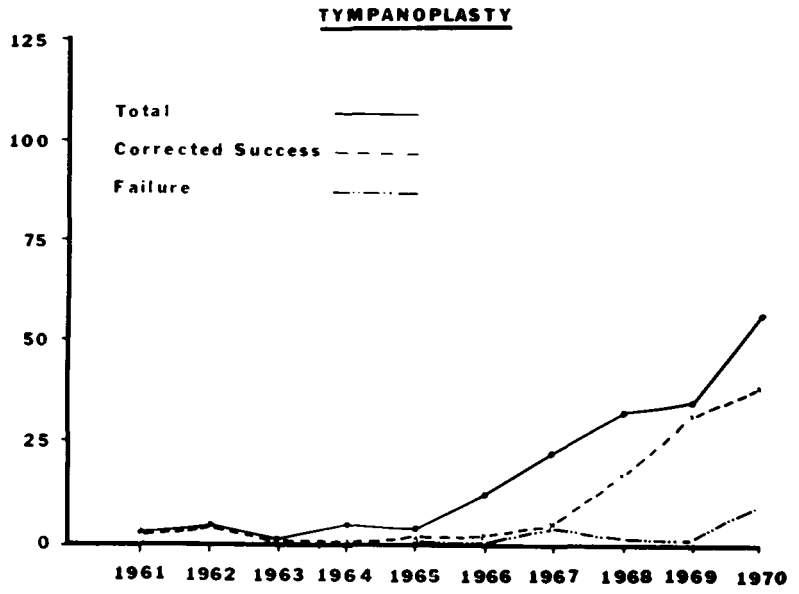


FIG. 2.

Definitions

Myringoplasty, tympanoplasty, Attended Series, and series X—all defined previously (Booth, 1973).

Corrected success—excluding all those patients in the Series X group who failed to complete a six-month follow-up, i.e. if they are all assumed to have failed, an unlikely but theoretically possible result.

Uncorrected success—all successful cases including those with less than a known six-month follow-up.

Results

1. *Contralateral ear*

The state of the contralateral ear in the successful series (uncorrected) and the failures is shown in Table I. From this it will be noted that a perforated contralateral ear was present in 19 per cent of the successful series but in 30 per cent of the failures. This achieves statistical significance ($x^2=8{\cdot}796$; $p<0{\cdot}01$).

A possible interpretation of this, is that it is the rule that the ear with worse hearing that is operated upon, i.e. in the person with bilateral

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disease, the severity of this in the worse hearing ear, is sufficiently marked as to mitigate against a successful result. Conversely if one ear has already been successfully grafted, the chances of the second ear achieving a successful result are improved.

TABLE I.

	Success		Failure	
Normal	(230)	42	(81)	41·5
Grafted	(45)	8	(3)	1·5
Scarred	(151)	27	(47)	24
Perforated	(106)	19	(58)	30
Mastoid, etc.	(14)	3	(6)	3

(Two of the successful cases—no details of state of contralateral ear)

2. *Length of follow-up*

Figure 3 shows the age of the patient at operation and the graft material used. No unexpected pattern emerges. The age and sex distribution of the

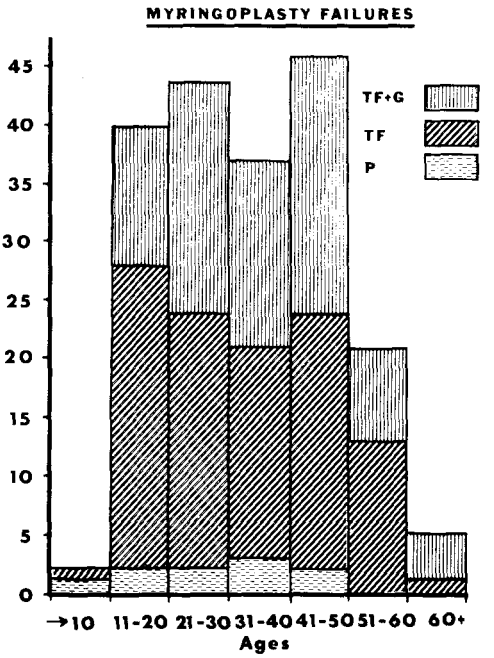


FIG. 3.

failures is shown in Table II. Age did not appear to be a factor which adversely affected the result. Comparison between Table II and that for the successes (Booth, 1973; Table III) shows that for some reason whilst there was a majority of females in Group B (M:F 30:36) amongst the

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failures, this was reversed amongst the successes (M:F 60:49). The same four periods of follow-up are shown.

TABLE II.

		Age range	Average age	
Group A	M 20	11–53	34·0	34·9
	F 17	12–58	36·8	
Group B	M 30	12–64	31·6	34·8
	F 36	8–67	37·4	
Group C	M 37	12–59	32·0	33·6
	F 36	9–52	35·2	
Group D	M 8	12–50	36·5	31·4
	F 11	14–46	27·6	

3. *Graft material*

Only cases which have been grafted with the same three materials as the successful cases have been analysed. Figures 4–6 show the preferences

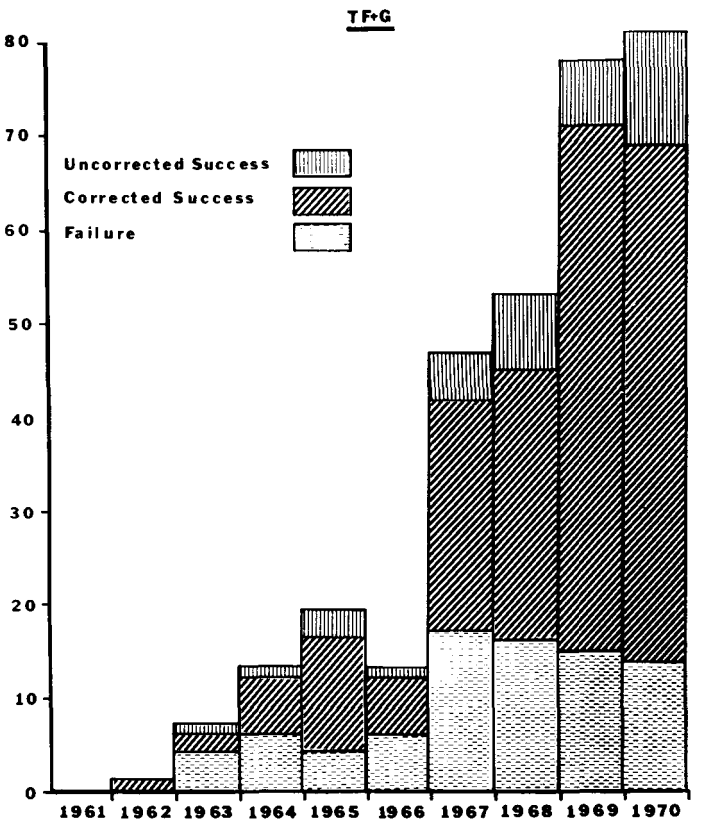


FIG. 4.

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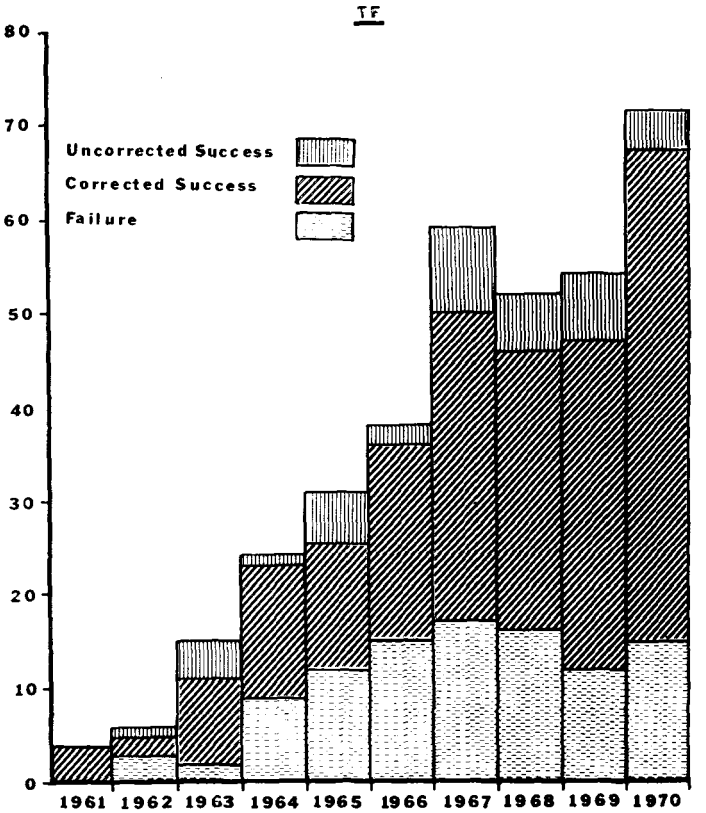


FIG. 5.

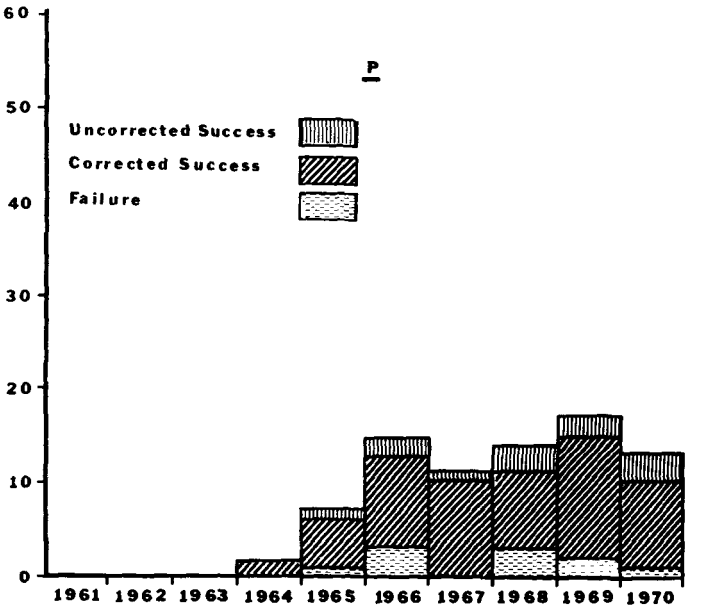


FIG. 6.

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of the material selected each year. There would appear to have been a greater increase in temporalis fascia plus gelfoam since 1967. The use of temporalis fascia has shown a gradual increase relative to the greater numbers of operations being carried out each year. The use of periosteum has remained almost constant. Happily with the increasing number of operations each year, the failure rate shows a trend to decline indicating that increased experience brings about an increasing success rate.

4. *Graft position*

The same three positions were analysed as in the successful cases. Table III shows the effect on the corrected and uncorrected success rates. Of the

TABLE III.

	Total		Corrected	
Temporalis Fascia + Gelfoam				
Onlay	(180)	67	61	(156)
Through	(14)	93	92	(13)
Underlay	(106)	80	76	(93)
Temporalis Fascia only				
Onlay	(311)	70	66	(276)
Through	(18)	78	76	(17)
Underlay	(33)	85	82	(28)
Periosteum only				
Onlay	(63)	86	82	(50)
Through	(18)	94	94	(18)

The numbers in the brackets are those of the Total (left) and Corrected (right) groups respectively.

four major methods of repair, the highest corrected rate was 82 per cent (P onlay) and the lowest 61 per cent (TF + G onlay). The four minor methods however achieved excellent results and perhaps their use should be considered more often. Alternatively it may be suggested that a certain versatility by the surgeon may allow him to choose a method appropriate to the position and size of the perforation which those with only limited experience may not possess, e.g. to graft an anterior perforation or subtotal perforation using an underlay technique to avoid blunting of the anterior meatal angle.

So far it has been indicated that age is not a factor associated with an increased failure rate. The position of the graft and the graft material show that some of the apparently less favoured methods deserve further consideration. However, it would also be helpful to know how experience, the pre-operative hearing level, the size of the perforation, how long should the interval between getting the discharging ear under control and carrying out the repair—is there a minimum optimum period, when a graft may most often be expected to break down and why?

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5. *Experience*

Table IV shows the effect of experience upon the success rate; for this purpose, the consultants and registrars are shown separately. It would appear that a beginner registrar achieved a more successful rate on average but the range is much wider than for the consultants. For ten to nineteen operations, the success rates are identical and further experience allowed the registrars to beat the consultants on average; the best of both achieved a 94 per cent success rate.

TABLE IV.

		Range	Average
Consultants			
Less than 10 operations	(4)	37–62	48
10–19 operations	(3)	64–81	71
20 or more operations	(8)	47–94	74
Registrars			
Less than 10 operations	(30)	0–86	73
10–19 operations	(13)	47–94	71
20 or more operations	(6)	64–94	81

An analysis was carried out of all surgeons (eight consultants, six registrars) who had performed twenty or more operations. Figure 7 shows the

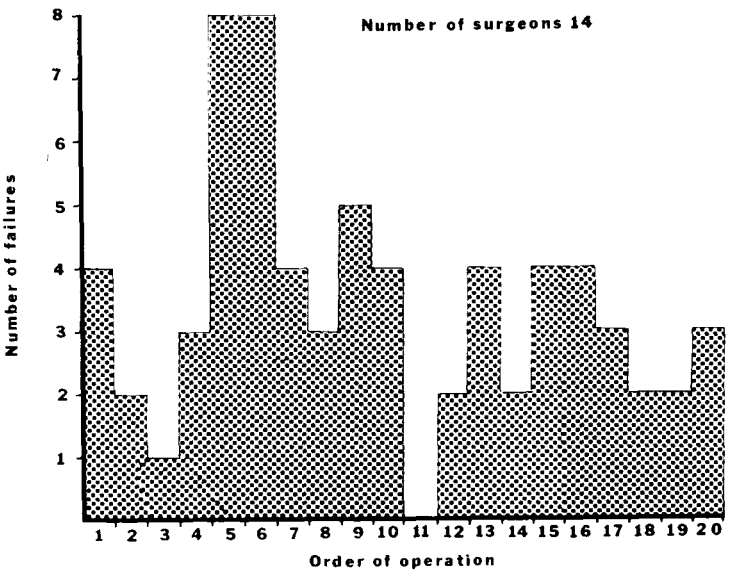


FIG. 7.

results of each of their initial twenty cases. From this it would appear that there were four failures amongst their first attempts. After three operations each, the failure rate had dropped to one. Complacency or lack of care

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appeared to set in for the fifth and sixth operations; this even reaches statistical significance ($p < 0{\cdot}0005$)! Thereafter they all seemed to settle down and take the operation seriously again, giving the attention to detail it deserves! It should however be remembered that the interval for any individual surgeon between his cases could be anything from a week to months.

6. *Pre-operative hearing level*

After the first two surveys published in the Preliminary Report, the results of the largest single group (TF only in the onlay position—seventy-four cases) were programmed and fed into a computer. An association was found between the pre-operative hearing level and the post-operative clinical mobility of the grafted drum, the poorer the former the poorer the latter.

7. *Size of the perforation*

Table V shows the corrected success rate in relation to the pre-operative size of the perforation. From this it will be seen that for perforations less than 50 per cent, the use of temporalis fascia onlay and temporalis fascia plus gelfoam, in the onlay and underlay positions, the results were rather significantly better than for perforations greater than 50 per cent (x^2 12·86, 4·97 and 13·88 respectively; these are significant at the 0·1, 5 and 0·1 per cent levels respectively). However the results for periosteum onlay show no significant difference for perforations greater or lesser than 50 per cent. A comparison of the results for temporalis fascia, onlay and underlay positions (for perforations under 50 per cent) shows that the underlay procedure is more successful (x^2 7·64, significant at the 1 per cent level). However a comparison between fascia with or without gelfoam in the onlay position (for perforations under 50 per cent) showed that the use of gelfoam did not materially influence the result of the operation (x^2 0·25).

TABLE V.

		Less than 25%	25–50%	More than 50%
Temporalis Fascia + Gelfoam				
Onlay	(156)	72	68	53
Underlay	(92)	89	90	56
Temporalis Fascia only				
Onlay	(275)	74	72	51
Periosteum only				
Onlay	(50)	62	88	94

(Only those successful cases which have had a six-month follow-up have been included; this table includes also the additional Series X cases).

Consideration of perforations greater than 50 per cent indicates that periosteum is better than any of the major temporalis fascia techniques.

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It should be emphasized that the smaller number of cases in which periosteum was chosen, were carried out by only a few surgeons and the high success rate with this material is largely due to the skill of one individual (consultant). Conversely it could be argued that this was the reason for his success!

8. *When does the graft fail?*

Table VI shows the interval, when it was recorded in the patient's notes that the graft had failed; only the four major techniques used have been analysed and the figures in the table are expressed as percentages. If a case was followed-up for three months, then 44–60 per cent of those that failed occurred during that period. (The date of failure recorded was that of the first attendance when the failure was noted, not the average between that attendance and the previous one. The pattern of follow-up therefore is a variable entity though a graft which does not appear to be making satisfactory progress would normally receive more frequent check-ups during the early period (i.e. for about three months). It should be stated that a follow-up longer than one year was not carried out in many clinics in the hospital because of pressure of work and it would be quite erroneous to insinuate that the figures given in the table are rates of prediction. How many of the Series X cases would have failed if they had been followed up for longer is a matter of pure speculation. It may be recalled (Booth, 1973; Table XVII) that '36 per cent of the Series X cases failed to attend the clinic for as long as six months. Of the 145, who did continue to attend for this period, twenty-seven attended for longer than two years, twelve for longer than three years, seven for longer than four years and a single case for longer than five years'. (Fifty-five attended for six months to one year; forty-three attended for one to two years after operation.)

9. *What is the optimum time for operation?*

In the past it has been common to read that the perforated ear should be dry for a certain period of time before surgery is suitable. It is often considered that the longer the ear has been dry, the better the chances of success. At one time a minimum dry period of six months was advocated but more recently this interval has been reduced to three months or even six weeks. Some surgeons will accept a case provided it is dry 'on the day' of operation.

Table VII shows the effect of the length of the pre-operative 'dry' interval on the success rate, expressed as a percentage, e.g. 61 per cent of the cases which were dry for less than six weeks and were grafted by the temporalis fascia plus gelfoam onlay technique were successful. From these percentage results, it will be seen that pre-operative dry interval appears to make no difference whatsoever. Indeed the cynical could suggest that a

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TABLE VI.

		Less than 1 month	5 weeks–2 months	3 months	4–6 months	7 months–1 year	1–2 years	2–3 years	3–4 years	4–5 years	After 5 years
Temporalis Fascia + Gelfoam											
Onlay	(60)	25	25	3	17	13	5	7	2	3	0
Underlay	(21)	33	14	9	9	9	14	5	0	5	0
Temporalis Fascia only											
Onlay	(94)	28	21	11	16	8	10	2	0	2	2
Periosteum only											
Onaly	(9)	22	22	0	0	11	11	11	11	0	11

period longer than six weeks in the patient grafted with periosteum in the onlay position gives a poorer success rate!

TABLE VII.

	Less than 6 weeks	7 weeks–3 months	4 months–6 months	Longer than 6 months
Temporalis Fascia + Gelfoam				
Onlay (151)	61	60	57	62
Underlay (90)	77	69	79	95
Temporalis Fascia only				
Onlay (271)	61	69	61	69
Periosteum only				
Onlay (53)	100	94	80	77

It would be interesting to know if the length of the pre-operative dry period had any bearing on the date when failure might occur post-operatively, i.e. is there any critical period for any particular technique when extra surveillance might be helpful? This factor was examined in Tables VIII and IX which show the pre-operative dry period and the post-operative failure time for two methods of repair—TF + G and TF onlay. Again no picture emerges which can help in prediction.

TABLE VIII.

	Less than 6 weeks	7 weeks–3 months	4 months–6 months	Longer than 6 months
Temporalis Fascia + Gelfoam Onlay (60)				
Less than 1 month	2	5	6	2
5 weeks–2 months	1	2	4	10
3 months	0	1	0	2
4 months–6 months	1	3	2	1
7 months–1 year	2	0	2	4
1–2 years	1	0	1	1
2–3 years	0	3	0	1
3–4 years	1	0	0	0
4–5 years	2	0	0	0

TABLE IX.

	Less than 6 weeks	7 weeks–3 months	4 months–6 months	Longer than 6 months
Temporalis Fascia only Onlay (94)				
Less than 1 month	8	5	7	6
5 weeks–2 months	4	5	5	12
3 months	0	0	2	2
4 months–6 months	4	3	4	4
7 months–1 year	2	0	4	2
1–2 years	2	2	3	2
2–3 years	0	0	2	0
4–5 years	1	0	0	1
Longer than 5 years	1	1	0	0

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10. *Why does the graft fail?*

This is surely something we would all like to know. An examination of the records was made to see if failure was due primarily to necrosis of the graft or infection but unfortunately, any such distinction—even if valid—was noted on an insufficient number of occasions. Where infection was recorded only occasionally had a swab been taken for bacteriology when the discharge was first noticed. So again no lead could be given. It is regretted that this analysis cannot help on this point, nor can it help in relating the size of the mastoid air-cell system to the post-operative success rate.

Conclusions

1. It would seem reasonable to tell patients with bilateral perforations that the chance of a successful result when grafting the worst-hearing ear is diminished as compared with those having only a unilateral perforation.

2. The choice of graft material and position will initially be influenced by the experience of the individual surgeon. However it would appear that versatility in technique does pay dividends and later on the surgeon should make some effort to match the problem with the reconstruction rather than routinely adhering to the same technique.

3. For perforations less than 50 per cent of the surface area of the tympanic membrane, temporalis fascia gave a better 'take' rate and the underlay gave an increased success rate compared with the onlay position. It may be remembered that previously it was shown that a temporalis fascia graft supported by gelfoam helped to produce a more compliant grafted drumhead, it helped to prevent the graft either becoming stuck down or becoming thinner as healing took place. For perforations greater than 50 per cent, periosteum seems overdue for a revival but it should not be overlooked that the mobility of this material is related to the hearing result (as also was the case with TF + G onlay) but not in the case of TF + G underlay and TF onlay.

4. The underlay graft largely solves the problem of blunting of the anterior meatal angle and in addition provides a slightly larger surface to which the graft can be applied at the anterior rim. Furthermore this did appear to be important when assessed from the hearing result as well as the aesthetic point of view. Retraction of the graft from the handle of the malleus had a similar effect and all but one of such results (13 out of 292 cases) were seen following onlay grafts.

5. The ear should be dry at the time of operation but long periods do not appear to make a sufficient degree of difference to warrant their ritual observance.

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statistical analyses. I am again indebted to Mr. D. J. Connolly and the Department of Clinical Photography of the Institute of Laryngology and Otology.

Appendix

Myringoplasty and tympanoplasty (types II and III) (Attended Series, Series X and failures)	919	
Re-operations	91	
Staged operations	16	
Cases examined but rejected (poor selection) (Booth 1973, Table XLVI)	78	1,104
Other notes examined:		
Mastoidectomy	230	
Stapedectomy/ossicular discontinuity)	48	
Other materials—skin	70	
vein	51	
other	10	
Private patients	52	
No graft	13	
Operation—incorrectly listed and recorded	8	482
		1,586

(Myringoplasty—operations carried out between 1961 and March 1970).

(Tympanoplasty—operations carried out between 1961 and September 1972).

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