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A study of the long term results achieved by the Gillies Fry procedure*

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Summary—Renewed interest in delayed closure for cleft palate subjects revealed that no evaluation had been undertaken of patients who underwent the original Gillies Fry procedure. In the present investigation, 10 subjects operated upon prior to 1948 according to the Gillies Fry recommendations were evaluated for facial development, occlusal relationship, speech performance and velopharyngeal seal. Comparison of the cephalometric findings with accepted norms and examination of study casts gave encouraging results for facial and occlusal development. Speech quality covered a wide range of attainment, the best being rated highly. Endoscopic examination demonstrated regular velopharyngeal seal during swallowing but only one subject who regularly achieved velopharyngeal seal in speech. It was concluded that, although some claims for the procedure may have been a little enthusiastic, advantages accrued from it which were not accorded by other surgical approaches of the time, particularly so far as facial development and occlusion were concerned.

Delayed closure of the hard palate in the cleft patient is one of the more contentious issues debated by those responsible for the care and treatment of this group. The most widely quoted protagonists are the Schweckendieks, father and son, but the more assiduous reviewers of the literature are able to trace the concept to the publications of Gillies and Fry (1921) and Fry (1921). Witzel *et al* (1984) are disparaging in their reviews of these papers: "There were no further reports on whether this procedure was actually adopted or whether it was successful". To suggest that the procedure was published as an unpractised notion betrays an ignorance of the stature of the authors and overlooks the implied evidence to be found in the joint 1921 paper and a further publication by Fry (1924).

However, the charge that there was no published evaluation of the original Gillies Fry approach did appear to be valid and this contribution seeks to remedy the deficiency.

The historical context

In the early decades of this century the most common operations undertaken in Britain for cleft palate were those described by Brophy, Lane and von Langenbeck. In the 1921 joint paper, Gillies made observations upon all three. Brophy believed erroneously that there was no tissue deficiency associated with the cleft: his use of a wire suture to approximate the cleft prior to closure thus produced a very narrow maxilla, damaging and displacing tooth buds (Fig. 1). The Lane operation resulted in a tight, scarred soft palate. That produced by the von Langenbeck operation was more mobile but again proved to be too short when the hard palate defect had been wide. The short palates produced

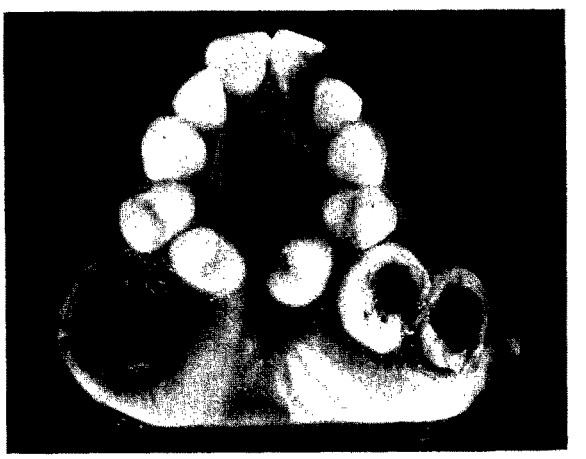

Fig. 1

Figure 1—A maxillary model demonstrating the sequel to the use of a Brophy wire suture.

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speech difficulties, the undue approximation of the maxillae resulted in narrowed nasal passages and severe malocclusions whilst the collapse of the nasal base gave rise to poor facial appearance. Gillies had already devised an epithelial inlay to counter the latter problem but a new approach was necessary to avoid the remaining deficiences.

The Gillies Fry recommendations

The aims and procedures are laid out in the 1921 paper, whilst the timing was dealt with more explicitly by Fry (1924).

The ideals aimed for were perfection in mastication (through the agency of an unaffected dental occlusion), normal nasal respiratory function and undisplaced maxillae resulting in normal bony contour. The means of achieving these ideals lay in the avoidance of any early surgery. The infant might wear a prosthesis to aid feeding and speech but soft palate closure was not advised until 6 to 8 years. The operation was a simple procedure, the reconstituted soft palate being maintained against the posterior pharyngeal wall by a specially designed appliance immediately after surgery and later by the prosthesis which also closed the hard palate defect. The hazard of bad speech resulting from late closure was termed a fallacy and the claim was also made that the simple prosthesis obviated continual dental treatment in later life.

The present study

Ten patients who had undergone Gillies Fry procedures and who had received treatment in the Department of Prosthetic Dentistry at Guy's Hospital were included in the study. Investigations were aimed at determining the extent to which the procedure had met the aspirations of its innovators. To this end facial development, occlusal relationship, speech performance and velopharyngeal function were assessed.

Profile of the group studied

All subjects were English Caucasian and their relevant details appear in Table 1. Within the

Table 1 Details of patients in study

Subject	*Sex*	*D.O.B. month/year*	*Cleft type*	*Gillies Fry op.* *Year*	*Age*	*Later surgery*	*Teeth present*
AB	F	9/28	UCLP	1939	11†	No	7 4321 | 4567 765 321 | 1234567
DH	F	7/17	CP	Unknown		No	543 | 2345 7
DM	F	8/31	CP	Unknown		No	7 3 1 | 1 3 7 5 321 | 12345
DMcK	F	3/23	CP	1928*	5	Yes	765 321 | 123 5678 765 321 | 123 567
AP	F	4/34	UCLP	1943	9	Yes	7 5 321 | 123456
GT	M	3/23	UCLP	1944	21†	Yes	7 1 | 7 7 4321 | 123 5
JT	F	4/23	CP	1928	4†	No	876543 1 | 1 345678 7654321 | 1234567
MW	F	11/16	CP	1947*	31	No	
VW	F	6/23	BCLP	1928	5†	No	765 | 234567 6 4321 | 1234 6
DW	M	10/33	UCLP	1935	2†	No	76 321 | 1 345 7 7654321 | 1234567

* Previous, unsuccessful, attempts at palatal closure
† Operations by Sir Harold Gillies.
CP, Post alveolar cleft palate; UCLP, Unilateral cleft lip and palate; BCLP, Bilateral cleft lip and palate.

group, females outnumbered males 8:2 and there was a 17 year span in the birth dates between 1916 and 1933. Of the clefting patterns, 5 had been born with isolated cleft palate, 4 with complete unilateral cleft lip and palate, 1 with complete bilateral cleft lip and palate. All necessary lip repairs had been undertaken during infancy: the bilateral lip subject had also undergone a Gillies vestibuloplasty.

There was a wide range during which soft palate surgery had been undertaken. In some cases (marked with a single asterisk) earlier attempts at total palatal closure had been unsuccessful. Of the 7 subjects who knew the identity of the surgeon who undertook soft palate surgery, 3 names were mentioned including that of Sir Harold Gillies. He performed 5 of the operations (marked with double asterisks).

In recent years, 3 subjects had been recommended for surgical closure of their hard palate defects. DMcK underwent a Moore sandwich pushback operation (Moore, 1960; Bennett, 1973) as did GT, the latter with a subsequent inferiorly based pharyngoplasty. Closure for AP was achieved using a bone graft and lateral tongue flap. The benefit which accrued from these procedures (apart from considerable psychological advantage) was that one patient was freed from the need to wear any form of appliance and the dental prostheses made for the other two were rendered simpler and more efficient (Fig. 2). Seven of the group received all of their dental care at a specialised unit; the remaining 3 had received routine treatment from the general dental service and had been referred for prosthodontic care.

Fig. 2

Figure 2—Subject GT (A) before and (B) after the late push back repair of the characteristic Gillies Fry defect.

Growth and facial development

Foster (1980a) suggests that the concensus of opinion concerning development after total repair of the cleft palate during infancy is that the maxillae demonstrate reduced growth potential in all planes. The maxillae thus become narrowed, retroposed and supraposed. It also seems that the effect is greater in transalveolar cleft lip and palate compared with isolated cleft palate. There is less agreement on the effect of clefting on mandibular growth. For example, Krogman *et al* (1975) reported this to be unaffected whilst Hayashi *et al* (1976) suggested that the mandible was shorter at all ages in the cleft subject and Bishara *et al* (1985) found the mandibular plane to be of an increased steepness in persons with unoperated cleft.

In our investigation, two analyses were made using standard lateral skull radiographs. The first was the routine orthodontic analysis in which comparison was made with the cephalometric norms for English subjects, established by Ballard (1956). The second parameter for comparison was the Bolton standard for an 18-year-old subject, the oldest in a sequence of cephalometric tracings representing the idealised dentofacial development in Caucasian Americans (Broadbent and Broadbent, 1975). (Fig. 3) illustrates the Bolton tracing overlaying one of our subject's radiograph, the two being centred on the sella turcica. The results of this phase of the investigation are summarised in Table 2 and the significance discussed in the conclusions of the investigation.

Dental occlusion

Seven subjects presented with natural teeth in both dental arches. None gave a history of formal orthodontic treatment, but in one instance (DMcK)

Fig. 3

Figure 3—The Bolton standard outline superimposed on the radiograph of DW. He was the only subject to show a more developed profile than the standard.

maxillary premolar teeth had obviously been extracted for the relief of overcrowding.

In 4 subjects a normal relationship obtained between the upper and lower buccal cusps of the posterior teeth, that is the upper cusps occluded external to the lower. In 2 subjects the buccal occlusion was cusp to cusp—indicating a relative narrowing of the maxillary base and in only 1 case was there a reversed cusp/fossa relation: this was the sole instance of serious occlusal disruption since the posterior width disparity was compounded by an anterior open bite (Fig. 4).

The amount of tooth loss made it difficult to assess the antero-posterior relationship of the occlusion and only 5 subjects could be assigned to one of the classic Angles classes. Of these, 2 were placed in Class I, 2 in Class II (mandibular post-normal occlusion) and 1 as a mild Class III (mandibular pre-normal occlusion). Where there were standing incisor teeth in both arches, there was no instance of reverse horizontal overlap (anterior cross bite). These results are of interest when viewed against the hazard which continued long after the time of Gillies and Fry, in which routine palatal closure caused a reduced maxillary dental base and thus a pre-normal occlusion (Ricketts, 1956).

Speech

Eight of the ten patients were available for assessment, which was carried out in the Department of Speech Therapy at Guy's Hospital.

Broad based subjective criteria were used in the investigation as follows:

(i) Abnormal nasal resonance: hypernasality; this was rated on a 0 to + + + scale (the possibility of hyponasality was considered but in the event this did not occur).

(ii) Nasal emission: audible escape of air through the nose during speech; this was rated on a 0 to + + + scale and the presence of nasal grimace was also noted.

(iii) Articulatory deviance: this was rated on a 0 to + + + scale; detailed phonological analysis of individual subjects is not included in this study.

Table 2 Cephalometric findings of patients in study

Subject	*Cleft type*	*Comparison with Bolton standard (mm)*		*∠SNA (deg)*	*∠SNB (deg)*	*∠SNA–∠SNB (deg)*	*Lower facial proportion (%)*	*Gonial angle (deg)*
		Point A	Point B					
AB	UCLP	−8	−9	70	72	+1*	52	126
DH	CP	−15	−18	83	80	+3	54	151
DM	CP	−13	−13	82	82	0	53	140
DMcK	CP	−3	−7	84	80	+4	54	130
AP	UCLP	−8	−5	68.5	73	−1*	52	152
GT	UCLP	−2	−8	83	77	+6	54	126
JT	CP	−4	−9	79	74	+5	55	129
MW								
VW	BCLP	−10	−9	70	73	0*	56	137
DW	UCLP	+4	+6	80	80	0	53	127

* Corrected figure necessitated by ∠SNA lying outside the range 82° ± 3°.

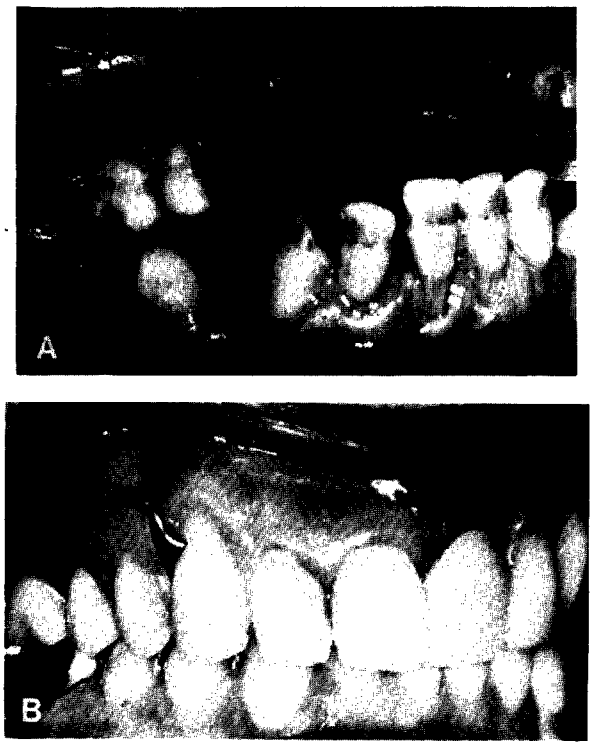

Fig. 4

Figure 4—(A) The least favourable dental result, despite which the arch width relation was in harmony (VW). (B) One of the more favourable occlusal relationships (DW).

(iv) Overall intelligibility: this was rated on a 4 point scale in terms of "nil" (unintelligible), "poor", "adequate" and "good" (near normal to normal).

Also noted as being of particular relevance was whether or not the subject had received any speech therapy, either in childhood or later life, and the presence of any degree of hearing loss which might contribute to disturbance of speech.

Audio-visual recordings were made of the subjects (wearing their prostheses if appropriate) and these were viewed by a panel of seven speech therapists who rated them according to the evaluation criteria described. The material used for these subjective ratings was a reading passage (standard for all subjects) and a sample of free conversation of 5 to 7 minutes length. Apart from one of the authors who sat on the evaluation panel, no other members had any knowledge of the subject's cleft type, age at which the Gillies Fry procedure was undertaken, or of any subsequent surgery.

There was a high level of consistency in the therapists' ratings and the 7 sets were averaged to produce the results given in Table 3.

Velopharyngeal function

Audio-visual records of velopharyngeal function were obtained using transnasal endoscopy. Viewing was through a rigid Stortz Hopkins telescope as advised by Pigott and Makepeace (1975) and the image transmitted to the monochrome camera through a beam splitter and optical arm. The slow search and frame by frame facilities of the VHS recorder eased the subsequent analysis of recordings.

The tapes were viewed repeatedly to observe pharyngeal and soft palate movement. A scale of 0 to + + + was established to rate the degree of muscular activity of the various sites and provided a means of comparison within the group. The findings for the 8 subjects endoscoped are summarised in Table 4.

Passavant ridge activity was found during speech in 3 subjects. When present, the ridge was manifest in posterior and lateral pharyngeal walls, not necessarily with equal vigour in both sites. The posterior wall activity in subjects AB, AP and JT was comparable, the + + rating indicating that the ridge was well defined morphologically but not a constant functional feature for all attempted velopharyngeal closures. The degree of lateral pharyngeal wall (LPW) and soft palate movement correlated quite well for most subjects.

Only one subject (JT) regularly produced a seal during speech. For the others the degree to which the seal was deficient broadly related to the degree of activity by the various muscle groupings and the dimensions of the velopharyngeal portal at rest. During swallowing activity DW was the only subject not to exhibit total seal: he was also one of two not to exhibit a vigorous sphincteric pattern of velopharyngeal closure during this activity.

In comparing the speech therapists' findings with those of the endoscopy it was found that these were broadly compatible for individual subjects. For example JT and DW, who had both demonstrated good lateral pharyngeal wall movement and soft palate mobility, did not present with nasal emission. Across subjects, however, the correlation was not so obvious. DH, AP and GT were rated similarly for abnormal nasal resonance and nasal emission but varying characteristics were observed on endoscopy.

Table 3 Speech findings of patients in study

Subject	*Speech therapy received*	*Abnormal nasal resonance*	*Nasal emission*	*Articulatory deviance*	*Overall intelligibility*	*Hearing loss*
AB	Yes	+	+	+	Good	No
DH	No	+	++ With nasal grimace	++	Poor	Yes, no hearing aid
DM						
DMcK	Yes	++	++	+	Adequate	Yes + hearing aid
AP	Yes	+	++ With nasal grimace	+	Adequate	Yes, mild + hearing aid
GT	No	+	++ With nasal grimace	+++	Adequate	No
JT	Yes	0	0	0	Good	No
MW						
VW	Yes	0	++	++	Adequate	No
DW	Yes	+	0	+	Good	No

Conclusions

Although most facial profiles in this study failed to match an idealised standard, facial proportioning was good for the group as a whole and there was no instance of supraposed maxillae. According to Foster (1980b) the anticipated outcome of complete post or transalveolar palatal closure is usually a mandibular protrusion. This is due to the lack of forward growth of the maxillae (resulting from surgery) being relatively greater than the reduced forward growth of the mandible, a tendency exhibited by cleft subjects. In contrast to this situation, it was an interesting finding in the Gillies Fry group that, for the most part, the maxillae were in better relation to the standard profile than the respective mandibles. Given the wide range of values for the gonial angle, firm conclusions are difficult to draw. However, with half the group exhibiting angles of 130° or more, the results would seem to parallel the work of Bishara *et al.* (1985) in their finding of an increased steepness of the mandibular plane in unoperated cleft subjects.

Given the absence of formal orthodontic care for the group, the maxillary and mandibular dental arch width harmony was impressive. The favourable dental base relationship was also associated with an absence of reversed horizontal and vertical overlap relationship in those subjects with anterior teeth. These findings concur with those of Poupard *et al.* (1983) who reported improved dental occlusion

Table 4 Endoscopic findings of patients in study

	Speech				*Swallow*	
Subject	*Passavant activity*	*L.P.W. mobility*	*Soft palate mobility*	*Deficiency of seal*	*Pattern of seal*	*Deficiency of seal*
AB	++	+++	+	−−	Sphincteric	0
DH	0	+	0	−−−	Sphincteric	0
DM						
DMcK						
AP	++	++	++	−	Sphincteric	0
GT*	0	+	+	−	Palatal elevation	0
JT	++	+++	+++	0	Sphincteric	0
MW	0	++	+	−−−	Sphincteric	0
VW	0	+	+	−−	Sphincteric	0
DW	0	+++	+++	−	Exaggerated speech pattern	—

* Subject underwent late pharyngoplasty
L.P.W.: lateral pharyngeal wall

in a recent series of cases treated on the "Gillies Schweckendieck" principle.

The claim by Fry concerning the elimination of the need for continuous dental treatment conferred by the procedure surely related to lengthy orthodontic care rather than to regular oral health maintenance. The low incidence of endentulousness found in our group was attributed to the regular overall dental supervision sought by individual subjects.

There is concern expressed at the inferior speech quality associated with modern delayed hard palate closure procedures (Poupard *et al.*, 1983; Witzel *et al.*, 1984), although the criteria for assessment are rather more stringent than those which applied in the original Gillies Fry era. When Fry claimed that the charge of bad speech associated with the procedure was a fallacy, we don't know what comparator he had in mind. In the light of Fry's observation, it is of note that our panel of speech therapists commented that the overall results were more favourable for the group under investigation than might be expected from a similar sample of cleft patients who had undergone alternative treatments of the period.

It was, perhaps, predictable that the subject who performed best in the speech evaluation had received speech therapy, exhibited the best overall velopharyngeal muscular activity, was the only one to demonstrate velopharyngeal seal during speech and had been born with a post alveolar cleft, albeit a large one. At the other end of the scale, the patient with the poorest overall intelligibility presented with the most disadvantaged background. Overall, the members of the group were happy with their speech performance although objective assessment did not necessarily give substance for their contentment.

The investigation demonstrated that, although not a widely practised approach to the cleft problem, the Gillies Fry procedure was viable and enduring. It was an advance in thought and, in the context of the times, conferred advantages over the established operations.

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