



The results of pharyngoplasty by muscle transplantation by Wilfred Hynes

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It is unfortunate that when Wilfred Hynes first described a lateral wall pharyngeal flap operation he mentioned only elevation of the scrawny salpingo pharyngeus muscle with the mucosa overlying it. This paper in the *British Journal of Plastic Surgery*¹ was readily available internationally² whereas his major report, a Hunterian Oration, in the *Annals of the Royal College of Surgeons of England*³ was not, and it was in the latter that he described the inclusion of the substantial bulk of the palatopharyngeus and also fibres of superior constrictor. He did publish again in the *British Journal of Plastic Surgery* in 1967.⁴ This paper is rarely cited⁵ but does state very clearly exactly from which tissue and how the flaps should be raised and inset. Crawford's restrained plea for acknowledgement of Hynes pioneering work in sphincter pharyngoplasty fell largely on deaf ears, though Millard thoroughly researched the priorities in Cleft Craft in 1980.^{6,7}

The operation may work in any of three ways: by advancing the posterior wall, reducing the lateral pharyngeal recess in a static manner or by producing an active sphincter. Hynes described "a very prominent and permanent posterior pharyngeal ridge, often contractile", and indeed the initial muscle bulk may project 15-20 mm but Moss *et al.*⁸ showed that there is a considerable range of projection 6 months later (1-12 mm, mean 6 mm).

Although the operation is now described as producing a sphincter, Hynes noted the considerable reduction in the area of velopharyngeal isthmus measured in one case as 7.40-4.53 cm² using a rather cumbersome dental compound called Stent during operation which probably stretched the isthmus. Even without overlapping the flaps shown in his diagram, the isthmus usually just admits the tip of the little finger and would have a cross sectional area of nearer to 3.0 cm². Subsequent scar contracture might reduce this or muscle atrophy increase it. Nevertheless, the operation certainly reduces the excessive lateral recesses of some cleft palate and some neurological cases. Substantial reduction of nasal escape and hypernasal resonance can follow even when little or no posterior wall advancement can be measured on barium coated lateral X-ray.

Hynes himself noted that about one third were actively sphincteric and this was confirmed by Moss. Writing from an extensive experience of the Orticochea⁹ modification of the Hynes pharyngoplasty, Lendrum and Dhar¹⁰ found that the majority of the "sphincters" became active although it might take 3

years for this to occur. It is interesting that the vertical fibres of palatopharyngeus, the antagonist of the levator and the muscle which actively opens the isthmus for nasal sounds, should contract even on attempted closure. From our knowledge of muscle transfer in hand surgery the need for considerable re-education would have been expected. Although the velopharyngeal musculature consists of striated fibres, cortical representation is virtually non-existent and voluntary movement is difficult to achieve.

A disadvantage of taking the entire bulk of palatopharyngeus is that the palate is no longer able to descend rapidly for open nasal sounds. Partial division of the muscle may be practised to minimise the risk. Less muscle bulk is available to advance the posterior pharyngeal wall but it is also possible that a short flap may be as important as a bulky one in ensuring a reduction of the resting orifice size.

From a practical point of view Hynes made a preoperative assessment of palatal mobility from oral inspection and added a Veau V-Y retroposition in cases judged to have moderate palate movements and a "push-back" operation dividing oral and nasal layers and providing an obturator for the hard palate defect in cases where the palate was badly scarred and immobile. Cine radiography was first described by Carrell¹¹ in the year before Hynes delivered his Hunterian oration and Hynes undertook no pre-operative investigation. Dey,⁵ writing 16 years later, used lateral X-rays to assess palate mobility and this is still the key mode in assessing the depth of the nasopharynx. Barium coating will provide additional information by outlining a Passavant ridge or revealing two layers of barium on the upper surface of the palate. These may be due to different degrees of mobility of the two sides, for example, in hemi palatal paresis, or irregular suturing of a cleft palate, or a midline valley as in a submucous cleft. Endoscopy will reveal the midline valley which must then be repaired or incompetence will persist, or confirm asymmetry of movement which would indicate the need for re-repair or an asymmetrical pharyngoplasty. Lateral X-ray will also indicate adenoidal bulk or the "box" like pharynx which results from adenoidectomy, some cervical spine anomalies and other cases of disproportion. Voluminous pharynx for any reason may dictate the need for palatal retroposition by combined V-Y push back and broad superiorly based pharyngeal flap¹² rather than the Hynes. Failure to appreciate these cases prior to operation is likely to result in continuing hypernasality and hypernasal resonance. It is probably due to this in

addition to lack of bulk of lateral wall flaps used by surgeons who read only Hynes's first paper that has resulted in his operation falling out of favour. However, Riski *et al.*¹³ in a thoroughly researched group of patients using the Hynes technique, taking salpingo pharyngeus and the whole of palatopharyngeus but sparing the superior constrictor, emphasised the success in patients exhibiting sphincter closure and reported equally good results in patients with large pre-operative gaps to those with smaller gaps. Hynes also advised the topical application of 1/1000 adrenaline to the pharyngeal wall together with Hexamethonium for adults and states that this produced excellent haemostasis.

Lendrum¹⁰ points out that the low inset of the Orticochea operation is very much quicker and easier than the Hynes. However its reliance on a rather haphazard sphincter action to complete closure in the commonest group of cases where the original defect is also central rather negates this benefit. Both Orticochea and Lendrum indicate the need for a staged operation, one side at a time though later authors have not substantiated this requirement. Hynes advocated that his muscle transposition operation (he used the word "transplantation" in the days prior to the acquisition of a specific meaning for the word) be performed prior to palatal surgery in selected cases, presumably in adults, since he also cautioned against using it in children under 10 years because of low encroachment of the adenoids.

Hynes described the very effective method of suturing nasal catheters to the free border of the palate using them to pull the palate up and forward. He attached the ends to the head towels but with a mastoid strip gauze placed between the catheters to distribute pressure over the columella, one forceps across both can securely maintain the tension. The manoeuvre pulls the posterior pillars up into view and makes it easier to obtain a sufficient length of flap. As tonsillectomy is now uncommon, the bulk may make accurate visualisation of all the fibres of palatopharyngeus difficult or impossible and tonsillectomy by careful dissection will be required in as many as three out of four cases.

Hynes made a simple incision through mucosa on the posterior wall and the trap-door of mucosa of muscle advocated by Jackson is unnecessary^{8,13}. What is essential is a very well placed muco muscular mattress suture between the flap tips, taking care to include those fibres on the deep surface that have retracted most. Provided that this suture holds, very adequate midline bulk is achieved and even total detachment from the posterior wall leaves a coronal "necklace" of tissue against which the palate can complete closure just as the lateral walls adduct against the sagittally orientated conventional pharyngeal flap. It is worth limiting incision to mucosa only since, on admittedly rare occasions, the tissue of the Hynes flaps necroses totally and a superior or inferior base flap can be raised including the intact muscular bed.

Hynes recommended that the base of the flap should not be taken above the level of the upper pole of the tonsil as damage to both nerve and blood supply of palatopharyngeus becomes highly probable and

marked atrophy if not total necrosis must be expected (Mercer, unpublished data).

The need to place the ridge as high as possible so that the palate may rise to abut against it is mentioned by Hynes and the transverse incision should be made at the very highest level that the operator technically can achieve. It cannot be placed too high. Hynes states that one should wait for the adenoids to atrophy so that the high placement can be made but the adenoids can be curetted away since clearly they are not contributing to closure or the operation would be unnecessary! The procedure can thus be done at any age once it is clear that velopharyngeal inadequacy is contributing to difficulty in acquiring normal patterns of articulation. Hynes had no hesitation in splitting the palate for access.

A particular problem is that the normal palate of the child rises to close onto the adenoidal mass beneath the basi sphenoid. It does not lengthen as does the adult palate. The velopharyngeal gap at the site of the levator eminence may be only a little more than 20 mm² but neither the Hynes nor the pharyngeal flap procedures can be placed anywhere near this level and the practical gap at, or just above, the arch of the atlas will be many times as big.

A new operation is needed to take account of this.

Hynes reported his results in 1953, as did his contemporaries, in terms of "speech" and did not appear to recognise that the velopharyngeal isthmus is almost entirely a valve and almost not at all an articulator. In the second half of his oration he considered carefully the concept of the larynx, oro and naso pharynx as resonators whose volume—and hence the pitch of the voice—changes as the position of the soft palate, tongue and pharyngeal walls moves. He noted the abnormally low oral breath pressure and low pitch of the voice when the isthmus was incompetent, but he made an assumption that a successful operation on the isthmus should result in "normal speech". However, in 1957 he made the distinction between nasal escape, nasal resonance and articulation faults very clear and stated that 'faults' in the palatopharyngeal region and faulty tongue movements may occur together or separately.¹⁴ He pointed out that mental retardation was often overstressed in association with cleft palate: that abnormal tongue movements developed in association with palatal incompetence were responsible for the apparent dullness of the patient, a mistake still made today.

In summary, the Hynes procedure as described by the originator in his papers of 1953 and 1967 rarely produces significant symptoms of velopharyngeal obstruction and should be considered as a relatively physiological operation with the potential to enable normal closure in a considerable proportion of cases of velopharyngeal incompetence.

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