THE EFFICACY OF MANIPULATIVE TREATMENT FOR STERNOMASTOID TUMOURS

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Sixty-seven patients with sternomastoid tumours have been treated by stretching and manipulation of the neck and the results evaluated after an average follow-up of six and a half years. Stretching was found to be useful in early management, although initial facial asymmetry and limitation of neck rotation of over 30° usually precluded a good prognosis. The results were also unsatisfactory if, during the first six months of treatment, improvement was slow; in such cases facial asymmetry and head-tilting frequently persisted.

The overall results of treatment for sternomastoid tumours are as uncertain as their aetiology. When any subsequent torticollis is severe, operation is generally advised (Staheli 1971; Bernau 1978; Takasugi 1980; Canale, Griffin and Hubbard 1982; Ferkel et al. 1983; Ippolito, Tudisco and Massobrio 1985). Although stretching is still widely employed as the first line of treatment during infancy (Hulbert 1950; Coventry and Harris 1959; Jones 1969; Ling and Low 1972; Hugenberg 1982; Morrison and MacEwen 1982) and the results are generally regarded as good, its value has nonetheless been questioned by others (Jones 1969; Lloyd-Roberts 1971), and its efficacy and complications have not been reported in detail. The present study was undertaken to evaluate the results of manipulative treatment during infancy and to establish criteria for prognosis.

PATIENTS AND METHOD

Between 1976 and 1977 206 Chinese children with sternomastoid tumours and restricted neck movement were treated conservatively as outpatients at the Queen Elizabeth Hospital, Hong Kong. Sixty-seven of them were examined by one of the authors (YKL) after an interval of six to seven years (average period of follow-up, 6.5 years).

The majority of the patients (87%) were treated within the first two months of life (Fig. 1). Treatment consisted of stretching the affected muscle, rotation to the side of the lesion, and side-flexion away from the side of the lesion, all performed slowly by the physiotherapist (Figs 2 to 4). These manoeuvres were repeated several times at each session and the entire treatment repeated at least twice each week. Active stretching also was encouraged by positioning the baby in specific postures during feeding, sleeping and play. Massage to the muscle was also advised. The babies were seen by an orthopaedic surgeon monthly, and then every three months until a full range of movement had been achieved.

Facial appearance. Head-tilting was assessed by asking the patient to stand straight and look forward: the opinions of both the examiner and the parent were noted and a photograph taken. Facial asymmetry is difficult to quantify and specific aspects of facial and skull asymmetry were measured on the two sides. These included the malar prominences for flattening, the frontal and occipital convexities for plagiocephaly, the width of the palpebral fissures at the centre of the pupils,
and the vertical length of the ears from the superior pole of the earlobe to the inferior pole. A photograph was taken in order to compare the vertical levels of the eyes and ears and the sizes of the eyes and cheeks (Fig. 5).

The eyes were tested for visual acuity by Snellen's chart, and any squint by examining eyeball movements in various directions and by the "eye cover test".

The spine was examined for scoliosis and, when a curve was seen, radiographs of the entire spine were taken to rule out the possibility of congenital vertebral anomalies.

**Neck movements.** The range of movement of the neck was measured and compared on the two sides. Passive movements were chosen as being more accurate than active because children seldom rotate or tilt their heads fully without also moving the shoulders. Rotation was measured using a plumb line attached to the centre of the chin while the head was rotated along a central vertical axis on a horizontal platform in front of the neck (Figs 6 and 7). Side-bending was measured using a similar plumb line attached to the occiput by a headband, while the shoulders were steadied and kept horizontal (Figs 8 and 9). Simple goniometers were developed for these measurements.
The overall results were graded according to the modified criteria of Canale et al. (1982) (Table I). The result was regarded as good if all cosmetic and functional criteria were satisfactory; fair when any one criterion was unsatisfactory, and poor when both cosmetic and functional evaluations were unsatisfactory.

**RESULTS**

As the results of treatment must be related to the initial severity, they were grouped into three categories according to the degree of limitation of rotation when the patient was first seen. In general, those with mild limitation of neck movement required three months of weekly physiotherapy to attain full range; the more severe cases needed four to five months of treatment with more frequent manipulations. We found that three-quarters of the patients obtained a good range of movement within six months of beginning treatment (Fig. 10), and that two-thirds of the sternomastoid tumours had disappeared within that time (Fig. 11).

**Assessment of appearance.** Twenty-seven patients were noted to have facial asymmetry at the start of treatment; in only 10 of these was symmetry regained with growth. The other 40 patients had no initial facial asymmetry but 23 of them had some facial or skull asymmetry at follow-up. Thus 60% of patients with sternomastoid tumours still had facial asymmetry in spite of early treatment.

A high proportion of patients also had persistent head-tilt (42%); this was apparently unrelated to the age when treatment began or to the initial limitation of movement. Of the 28 patients with persistent head-tilt, 10 actually had a full range of movement; this head-tilting, presumably habitual, was often seen only in clinical photographs.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Satisfactory</th>
<th>Unsatisfactory</th>
</tr>
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<tbody>
<tr>
<td>Cosmetic</td>
<td>Facial asymmetry absent or only apparent to examiner</td>
<td>Facial asymmetry obvious to parent and examiner</td>
</tr>
<tr>
<td></td>
<td>No head tilt</td>
<td>Head tilt observed</td>
</tr>
<tr>
<td></td>
<td>No palpable tightness</td>
<td>Tightness or loss of sternomastoid column</td>
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<tr>
<td>Functional</td>
<td>&lt;10° limitation of rotation or side-flexion</td>
<td>&gt;10° limitation of rotation or side-flexion</td>
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</tbody>
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Table I. Criteria for grading the final results (modified from Canale et al. 1982)
Table II. Overall results related to initial appearance and neck restriction and to duration of treatment in the 67 patients (percentage in brackets)

<table>
<thead>
<tr>
<th>Overall results after treatment</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial appearance</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Facial asymmetry</td>
<td>4 (15)</td>
<td>16 (59)</td>
<td>7 (26)</td>
<td>27 (100)</td>
</tr>
<tr>
<td>No facial asymmetry</td>
<td>19 (75)</td>
<td>20 (30)</td>
<td>1 (3.5)</td>
<td>40 (100)</td>
</tr>
<tr>
<td>Total</td>
<td>23 (34)</td>
<td>36 (54)</td>
<td>8 (12)</td>
<td>67 (100)</td>
</tr>
<tr>
<td><strong>Initial neck restriction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild to moderate (less than 10°)</td>
<td>21 (50)</td>
<td>16 (38)</td>
<td>5 (12)</td>
<td>42 (100)</td>
</tr>
<tr>
<td>Severe</td>
<td>2 (8)</td>
<td>20 (80)</td>
<td>3 (12)</td>
<td>25 (100)</td>
</tr>
<tr>
<td>Total</td>
<td>23 (34)</td>
<td>36 (54)</td>
<td>8 (12)</td>
<td>67 (100)</td>
</tr>
<tr>
<td><strong>Duration of treatment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than six months</td>
<td>1 (6.5)</td>
<td>11 (68.5)</td>
<td>4 (25)</td>
<td>16 (100)</td>
</tr>
<tr>
<td>Less than six months</td>
<td>22 (41)</td>
<td>25 (49)</td>
<td>5 (10)</td>
<td>51 (100)</td>
</tr>
<tr>
<td>Total</td>
<td>22 (33)</td>
<td>36 (54)</td>
<td>9 (13)</td>
<td>67 (100)</td>
</tr>
</tbody>
</table>

Functional assessment. Forty patients (60%) achieved a full range of neck movement. Slightly limited rotation (less than 10° of limitation) was fairly common (21 patients, 31%). More than 10° limitation of rotation occurred in three patients (4%) and limited side-flexion in eight (12%).

Residual tightness was found in either the sternomastoid muscle in 16 patients (24%); the whole muscle remained tight and there was residual torticollis in three (a failure rate of 4%).

Scoliosis was found in four patients who had mild curves of the thoracic spine which were probably physiological. There was only one case of ambylopia in a patient with a sternomastoid tumour defected in infancy but left untreated until the patient was five years old.

Overall assessment. To assess whether an initial facial asymmetry might have any bearing on the final outcome, the results of the 27 patients who presented with this feature were analysed further. Of these, only four (15%) had good results, in contrast to the overall good results in 34% (Table II); by contrast, seven had poor results (26%) as compared with the 12% of overall poor results. These seven patients with considerable facial asymmetry after treatment formed nearly 90% of the total of poor results. Statistical analysis (chi-square test, p<0.01) confirmed that patients with facial asymmetry at first presentation did not do as well as those without.

Analysis of initial neck restriction (Table II) showed that 50% of patients with only mild or moderate restriction had good results in contrast to only 8% of good results in patients with initially severe restriction (p<0.01). As most of our patients achieved a good range of movement within six months of treatment and most of the sternomastoid tumours disappeared during the same period, the results of patients requiring more than six months of treatment were compared with those requiring less (Table II). The difference was significant (p<0.025): those who required more than six months of treatment were more likely to have head-tilt, scoliosis and limited neck movement. On the other hand, it did not appear that a shorter period needed to restore neck movement indicated a better chance of recovery from facial asymmetry.

Complications of treatment. Intensive neck stretching is not without complications (Table III). In six patients rupture of the sternomastoid muscle occurred, with consequent loss of the muscle column. In 11 patients a clicking sensation or a feeling of the muscle suddenly giving way was experienced during one of the manipulations, often followed by immediate improvement in the range of movement; interestingly, at follow-up, six of these 11 had lost the smooth round contour of the sternomastoid column (Figs 12 and 13), the muscle being thinned and less prominent during contraction. Sometimes the ruptures were associated with bruising. There was one fractured clavicle.

DISCUSSION

Although a number of authors have doubted whether manipulation during infancy affects the eventual outcome of sternomastoid tumours, we could find no control studies which compared the results of stretching with no treatment at all. Because we have not done such a study, we cannot conclude that the final results we obtained were actually due to our treatment. Nor are the results we report final: the children are still growing and further improvement (for example, diminished facial asymmetry) or deterioration (for example, recurrence of torticollis) may occur later.

Nevertheless, early manipulations during infancy appear to be successful. Using the modified criteria of Canale et al. (1982), we obtained satisfactory results in about 90% of our patients and only 4% of the treated sternomastoid tumours progressed to produce muscular torticollis. These results are better than those which Jones' (1969) reported on the natural history of sternomastoid tumours: he operated on 20% of his patients, and 11% developed muscular torticollis later in life. Most of Macdonald's (1969) patients with sternomastoid tumours were not treated by physiotherapy, and he also reported a rate of muscular torticollis (14%) much higher than ours.

An average of about four months of stretching is needed to mobilise the neck, and those patients with less severe limitation of movement usually recover more
rapidly than the others. However, earlier presentation (and thus early treatment) within the first one or two months of birth did not produce faster recovery. Perhaps Dunn (personal communication) is right in advising that gentle stretching should begin only after the age of two to three months so that further damage to an already injured muscle is not produced.

Although limitation of neck movement does not seem to be a major problem, the cosmetic results are not satisfactory. Despite early stretching, in two-thirds of our patients facial asymmetry did not seem to improve. It may be argued that definite conclusions regarding persistent facial asymmetry cannot be drawn until growth in the facial skeleton has ceased (Jones 1969), but it is reasonable to assume that a significant percentage of patients will have some persistent facial asymmetry. Ferkel et al. (1983) found that neither the conservatively nor surgically treated patients showed any correlation between the age at treatment and the resolution of facial asymmetry. Canale et al. (1982) also found that 35% of those with facial asymmetry before treatment still had unsatisfactory cosmetic results some 20 years later. Similarly, Staheli (1971) noted that early treatment by operative release did not appear to reduce the likelihood of late residual facial asymmetry after an average of 13 years.

Another important cosmetic problem is persistent head-tilting; this is not uncommon after late surgical release (Ippolito et al. 1985), and it also occurred, despite early management, in nearly half of our patients, a significant proportion of whom actually had a full range of neck movement on examination. This uncontrolled habitual tilting may be related to adaptive changes in the soft tissues of the neck or to the sensory control of posture. We would thus recommend that the possibility of persistent head-tilting be mentioned to all parents so that postural re-education of the child may begin early, be given throughout the treatment period, and be continued thereafter.

From the number of complications we encountered it appears that, in spite of great caution and gentleness in stretching the muscle, occasional ruptures are inevitable. The click or sensation of giving way, together with the loss of the sternomastoid column in some of our cases, was probably due to dehiscence of the muscle fibres during stretching, producing a result similar to that of cutting the muscle. Although we regarded this as a complication, it may actually be advantageous and resemble "manual myotomy" which is sometimes recommended during the first few weeks of life (Kasai 1978). Nevertheless, rough manipulation should never be advocated.

We believe that manipulative treatment has a definite place in the management of sternomastoid tumours since it does at least retard contracture of the affected muscle and reduces the likelihood of subsequent operation being needed. However, its value in preventing facial asymmetry and head-tilting is limited. If manipulation is used, then initial facial asymmetry and limitation of neck movement of over 30° often precludes a good prognosis. Similarly, if satisfactory progress cannot be achieved within six months of beginning stretching, the results may well be unsatisfactory. In such circumstances, tenotomy may be advisable at a later age. Finally, although the overall prognosis is good, minor residual cosmetic defects are common.

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REFERENCES


