

# The management of Frey's syndrome with aluminium chloride hexahydrate antiperspirant

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**Nine patients suffering from gustatory sweating (Frey's syndrome) following parotidectomy have been treated by topical applications of aluminium chloride hexahydrate. Treatment has successfully controlled gustatory sweating using application intervals varying from 1 to 50 days.**

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Frey's syndrome is usually manifested by gustatory sweating and flushing in the preauricular and temporal regions but may be associated with a sense of warmth or, less frequently, pain (1,2). It is a frequent sequel to parotid gland surgery, occurring after 5–60% of operations (3,4) but, in general, patients are not sufficiently troubled to accept the various surgical treatments available (4), and the topical applications proposed (3,5) have not been widely adopted.

There is therefore a need for a simple, effective and commercially available non-operative means to control gustatory sweating.

Since the introduction of aluminium chloride hexahydrate for the treatment of axillary hyperhidrosis, the former regular referral of patients for surgical treatment has almost ceased. As the most troublesome aspect of Frey's syndrome is usually gustatory sweating, a group of patients suffering from this condition were treated by topical application of aluminium chloride hexahydrate.

## Patients and methods

Nine patients with gustatory sweating following conservative parotidectomy were treated with local applications of aluminium chloride hexahydrate 20% w/v in an alcoholic solution using a roll-on applicator.\* The patients were asked to apply the solution to the affected area at night and to avoid shaving within 12 h of application. They were asked to wash their hands carefully after use and to ensure that the solution was kept well away from the eyes. A theoretical danger of facial application is that the acidic irritant solution might enter and damage the eye, either by directly running in with sweat, or by digital transfer. This danger was therefore explained to prospective patients and a printed instruction sheet provided. After an initial period, applications were made only when sweating recurred.

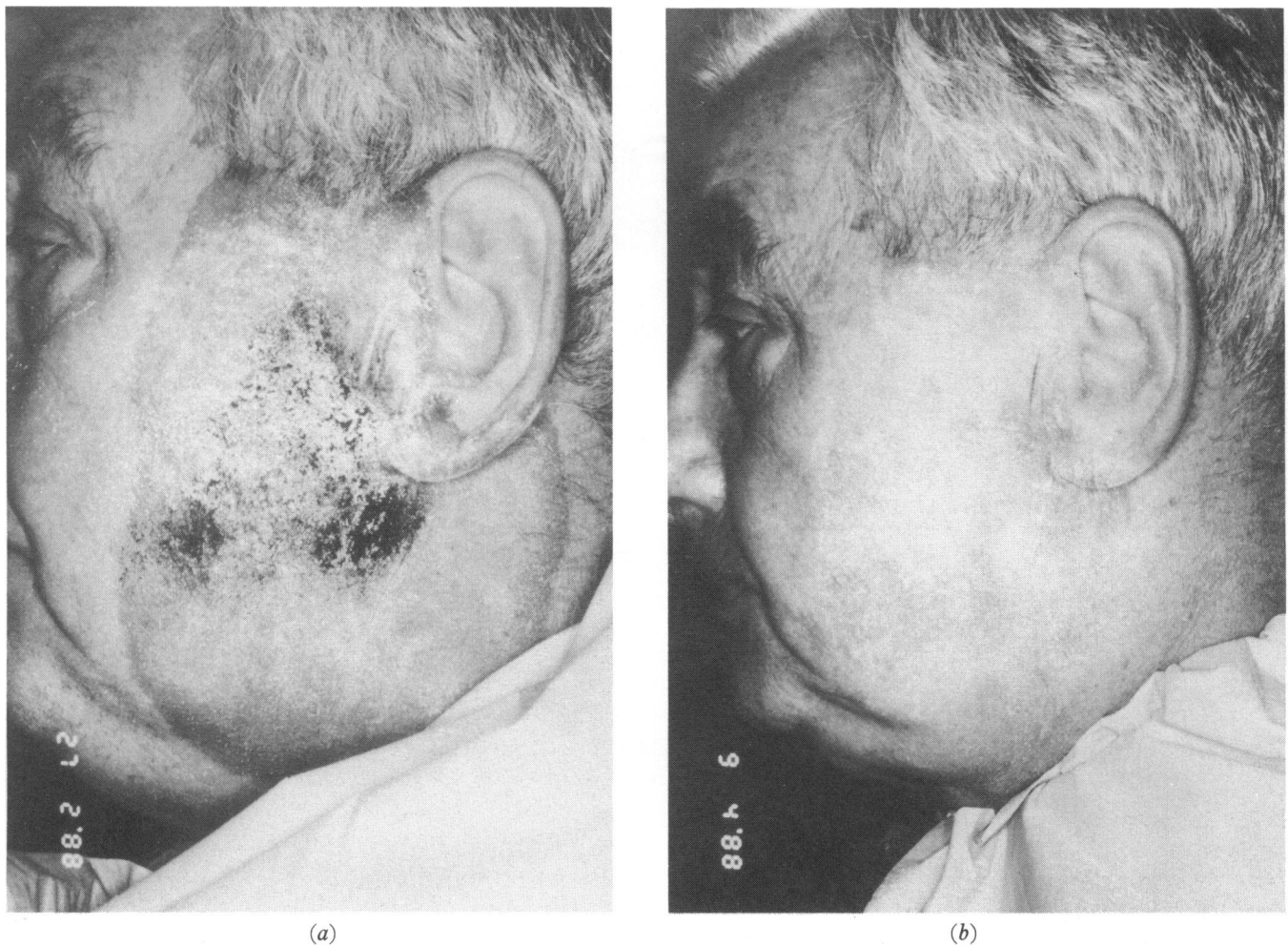
The diagnosis of Frey's syndrome was validated by Minor's starch iodine test and the tests repeated after applying aluminium chloride hexahydrate for four consecutive nights. A photograph was taken of the affected area during the test, before and after treatment, using a photograph of the opposite side of the face as a control (Fig. 1). The unlabelled photographs were shown to three independent observers who graded the response to Minor's starch test between 0 and 4 and the mean for each group calculated. The gustatory stimulus used was

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**Figure 1.** Patient 7: Minor's starch iodine test. (a) Affected side, pretreatment; scored 4, 4 and 4, mean 4.00. (b) Affected side, after treatment; scored 0, 0 and 2, mean 0.67.

**Table I.** Clinical details and the frequency of application of aluminium chloride hexahydrate required to control gustatory sweating in patients with Frey's syndrome following conservative parotidectomy and the patient's assessment

<i>Patient number</i>	<i>Operation and histological diagnosis</i>	<i>Age at operation and sex</i>	<i>Interval from operation to symptoms</i>	<i>Duration of treatment to January 1989</i>	<i>Frequency of application required to control symptoms</i>	<i>Assessment of value of treatment by patient</i>
1	SCP Lipoma	57 F	12 months	25 months	Every 7 days	8/10
2	SCP Pleomorphic adenoma	55 M	14 months	5 months	Every 2 days	8/10
3	SCP Benign cyst	39 F	6 months	25 months	Every 50 days	7/10
4	SCP Pleomorphic adenoma	61 M	3 weeks	31 months	Every 28 days	8/10
5	SCP Pleomorphic adenoma	41 M	12 months	10 months	Every 2 days	6/10
6	SCP Pleomorphic adenoma	64 M	6 months	26 months	Every 7 days	7/10
7	SCP Pleomorphic adenoma	60 M	6 weeks	30 months	Every 3 days	6/10
8	SCP Pleomorphic adenoma	34 F	6 weeks	26 months	Every 2 days	8/10
9	SCP Pleomorphic adenoma	48 F	12 months	25 months	Every 21 days	9/10

SCP = Superficial conservative parotidectomy

Table II. The efficacy of the treatment of Frey's syndrome with aluminium chloride hexahydrate as assessed by Minor's starch iodine test before and after treatment

Patient Number	Without treatment		Following treatment	
	Affected side	Control side	Affected side	Control side
1	4.00	0.00	2.00	0.33
2	3.00	0.33	2.33	0.33
3	2.00	0.33	1.00	0.33
4	3.67	1.33	0.33	0.67
5	2.67	1.67	0.33	0.33
6	3.00	1.67	0.33	0.33
7	4.00	1.00	0.67	0.33
8	3.00	1.67	2.33	0.00
9	1.67	0.00	0.67	0.00

the chewing of a Salivex<sup>®</sup>\* capsule, and the sucking of an ascorbic acid tablet. Each patient was asked to assess the value of treatment giving a score on a scale of 0–10.

## Results

Table I shows the patients' clinical details and the frequency of application of aluminium chloride hexahydrate required to control symptoms and the patient's assessment of the efficacy of treatment.

Table II shows the grading of the patients' response to gustatory stimulus as assessed by Minor's starch iodine test.

The patient's mean response to a gustatory stimulus, as assessed by Minor's starch iodine test (graded 0–4) was 3.00 on the affected side before treatment and 1.11 after treatment. The difference between the means of 1.89 is highly significant ( $P=0.0008$  using the paired  $t$  test with 95% confidence limits of 1.05–2.73).

The mean results after treatment of the affected side and of the controlled side were 1.11 and 0.29, respectively. The difference between these means was 0.82 and comparison using the paired  $t$  test gives  $P=0.0341$ , with 95% confidence limits of 0.07–1.55. This indicates that the treatment has not completely eliminated sweating under the maximal stimulation circumstances of the test.

All patients therefore responded to treatment with aluminium chloride hexahydrate as assessed both by their symptoms and Minor's starch iodine test. The response was not always complete but symptoms were abolished in most patients by regular application of the solution.

## Discussion

In 1923, Frey (1) described gustatory sweating and flushing in a Polish soldier following an infected wound

of the parotid gland. Duphenix first described the syndrome in 1757, and although there have been many subsequent descriptions, it is Frey's name that has been associated with the auriculotemporal nerve syndrome (1,2).

Injury to branches of the auriculotemporal nerve during parotidectomy may damage all three components—interrupting the parasympathetic postganglionic fibres to the parotid gland, the sensory fibres to the skin and the sympathetic fibres to the vessels and sweat glands in the region of its distribution. In the process of nerve regeneration, parasympathetic secretomotor fibres may become misdirected and grow along sympathetic pathways to the skin vessels and sweat glands (2). As both parasympathetic and sympathetic fibres are cholinergic, a gustatory stimulus produces sweating and flushing (1,2).

Surgical treatment of this condition has therefore been directed to interrupting the parasympathetic flow to the skin. To this end, resection of the auriculotemporal nerve may be successful, but tympanic plexus neurectomy has produced a more reliable response although recurrent symptoms can still occur (3–6). However, Sessions *et al.* (7) have reported sustained results with interpositional fascial grafts and this could be regarded as a final solution in stubborn cases.

In practice, few patients would entertain an operation for the relief of their symptoms. This has led to the trial of various non-surgical methods such as radiotherapy, which may be successful but is hardly justified, while systemic anticholinergic therapy produces unacceptable side-effects when used in effective dosage. Topical anticholinergic treatment may also produce undesirable side-effects but both gustatory sweating and flushing are reduced by this treatment (5). Hays (5) has demonstrated success with the anticholinergic substance glycopyrrolate with few side-effects, but a suitable preparation is not commercially available in the UK.

Topical application of aluminium chloride hexahydrate appears to work by a direct action on the sweat glands, probably by the formation of gelatinous hydroxides in the sweat ducts which obstruct the flow of sweat; it may also damage the sweat duct epithelium and cause inflammation (8).

Initial experience suggests that gustatory sweating is effectively controlled by its application and that patients suffering with Frey's syndrome will benefit from a trial of this simple treatment.

## References

- 1 Frey L. Le syndrome du nerf auriculo-temporal. *Rev Neurol (Paris)* 1923;2:97–104.
- 2 Gorlin RJ, Pindborg JJ, Cohen MM. Cranial nerve syndromes with orofacial manifestation. In: Gorlin R J ed. *Syndromes of the Head and Neck*. 2nd ed. New York: McGraw-Hill, 1976:195–215.
- 3 Powell ME, Clairmont AA. Complications of parotidectomy. *South Med J* 1983;76:1109–12.
- 4 Conley I. Gustatory sweating syndrome. In: Conley J ed. *Salivary Glands and the Facial Nerve*. Stuttgart: Georg Thieme, 1975:51–3.

\* Thames Laboratories Ltd, Isleworth, Middlesex, England

- 5 Hays LL. The Frey syndrome—a review and double-blind evaluation of the topical use of a new anti-cholinergic agent. *Laryngoscope* 1978;88:1796–1824.
- 6 Smith RO, Hemenway WG, Stevens KM *et al.* Jacobson's neurectomy for Frey's syndrome. *Am J Surg* 1970;120:478–81.

- 7 Sessions RB, Roark DT, Alford BR. Frey's syndrome—a technical remedy. *Ann Otol* 1976;85:734–9.
- 8 Aluminium chloride for hyperhidrosis. *Drug Ther Bull* 1981;19:101–2.

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## Notes on books

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**Scientific Foundations of Surgery** edited by James Kyle and Larry C Carey. 4th edition. 651 pages, illustrated. Heinemann Medical, London. £75.00.

When the first edition appeared in 1967 it was a milestone. It offered trainee surgeons—and their examiners—an up to date, authoritative review of basic human physiology and its disturbances in surgical conditions and the effects of surgical operations.

This edition lives up to the original intentions. The chapters have been revised and a new chapter on imaging techniques has been added. There are more than 80 expert contributors from all over the world.

The agreed changes in the FRCS examinations make one anxious that the high level of knowledge of basic sciences that we have demanded of trainee surgeons may be lost or diluted. The merging of the Primary and Final FRCS threatens to devalue both theoretical and practical aspects of surgery.

One can only hope that young surgeons, faced with such a massive field of knowledge they must acquire, do not neglect to read books of this quality and depth. 'Scientific Foundations' will have more lasting effects on the quality of surgery than many conventional practical surgery texts. R M KIRK

**Surgery for General Practitioners** by Brian A Maurice. 257 pages, illustrated, paperback. Castle House Publications, Tunbridge Wells. £15.00.

It seems highly likely that in the future an increasing number of general practitioners will carry out minor surgery. At present there are few books available to guide them in the basic principles of surgical technique. This volume therefore fills a notable gap in the surgical literature. It reads well, the illustrations are large and clear, and it restricts itself to those operations that are now principally performed by house officers. Indeed, house officers as well as general practitioners could well read the work with benefit.

**Textbook of Critical Care** edited by W C Shoemaker, S Ayres, A Grenvik, P R Holbrook and W L Thompson. 2nd edition. 1519 pages, illustrated. W B Saunders Company, Philadelphia. £59.50.

More than two hundred and twenty authors contribute to this massive second edition in which the number of chapters has grown from 123 to 164, sections on transplantation and nursing have been developed, and better integration of basic medical science and clinical practice has been sought. An important and authoritative reference volume.

**Introductory Medical Statistics** by Richard F Mould, 2nd edition. 192 pages, illustrated, paperback. Adam Hilger, Bristol. £9.35.

This book was first published in 1976 and received ecstatic reviews. It has now been much revised and enlarged but has retained the original humorous and enlivening manner which was so popular with reviewer and purchaser alike. Beginning with data presentation—do all readers know the difference between a bar chart and a histogram?—the book goes on to describe curves and distributions, probability, various tests of statistical significance, analysis of variance, regression and correlation. The emphasis throughout is on ensuring that the reader develops a practical facility in the use of statistics and to this end all the methods described are illustrated by real examples. These range from cancer, abortion, AIDS and tuberculosis on the medical hand to football match scores and greyhound racing theory on the other. Strongly recommended.

**Transplantation Reviews Volume 2** edited by Peter J Morris and Nicholas L Tilney. 224 pages, illustrated. W B Saunders Company, Philadelphia. £35.00.

Ten topical reviews in clinical transplantation and transplantation biology which will be required reading for all who work in this field. An international team of acknowledged experts are the contributors.

**Rheumatoid Arthritis Surgery of the Shoulder** edited by A W F Lettin and C Petersson. 138 pages, illustrated, Karger, Basel. £63.70.

Seventeen contributions from well-known surgeons in the field on the pathology and surgical procedures currently available for rheumatoid arthritis of the shoulder. The contributors come from both sides of the Atlantic and several European countries, making the volume a truly international overview.

**Diagnostic Imaging of the Acute Abdomen: A Clinico-Radiologic Approach** by Dieter Beyer and Ulrich Mödder. 453 pages, illustrated. Springer-Verlag, Berlin. DM180.

Although it is principally written for radiologists, many surgeons will find this book of interest. Numerous radiographic, CT and ultrasonic images illustrate the different causes of the acute abdomen. A highly structured, concise text in short-note style amplifies the illustrations. Registrars in general surgery will find the volume of special value.