

The need for and development of a single use disposable nasal spray

JEREMIAH F. COAKLEY, F.R.C.S.I., GRAHAM J. ARTHURS, F.C. ANAES., TINA K. WILSHER, M.R.PHARM. S. (Wrexham)

Abstract

Nasal sprays, which work on the Venturi principle, have the disadvantage of suck-back which makes them unhygienic for use in more than one patient. In Wrexham we have developed a disposable nasal spray system, which is safe and would be of benefit to other ENT departments.

Key words: Disposable equipment; Nasal spray.

Introduction

Cocaine spray and cocaine with adrenaline spray have been used, with great benefit, in the practice of otolaryngology for almost as long as the speciality itself. There is no doubt that cocaine is a very effective vasoconstrictor and local anaesthetic when used on the mucous membrane of the nose. It is usually applied to the nose in the form of a spray, though it can be used in liquid or paste form.

With the increasing use of fibre-optic endoscopic examination of the nose and larynx, a good vaso-constrictor and local anaesthetic is required for the nasal mucosa and cocaine fulfils this need. Lignocaine which is also a good mucosal anaesthetic has the disadvantage of being a vasodilator. Whichever drug is preferred, a hygienic way of

getting it into the nose in the form of a spray is required. The main concern of this paper is the applicator used to deliver the drug. In most ENT departments the spray applicator is the Downs' atomiser (Fig. 1). This apparatus and others like it have a basic design fault, which causes a suck-back which makes them unsuitable as nasal sprays for use in more than one patient.

The Downs' atomiser (Fig. 2), works on the Venturi principle. It has a very fine inner glass tube contained within a slightly larger glass outer tube. The outer tube is connected to a bellows. Both the inner and outer tubes are

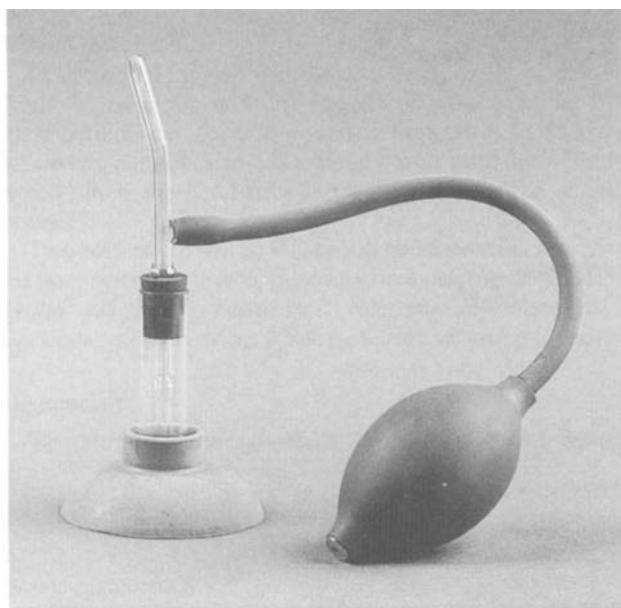


FIG. 1
Downs' atomiser (photograph).

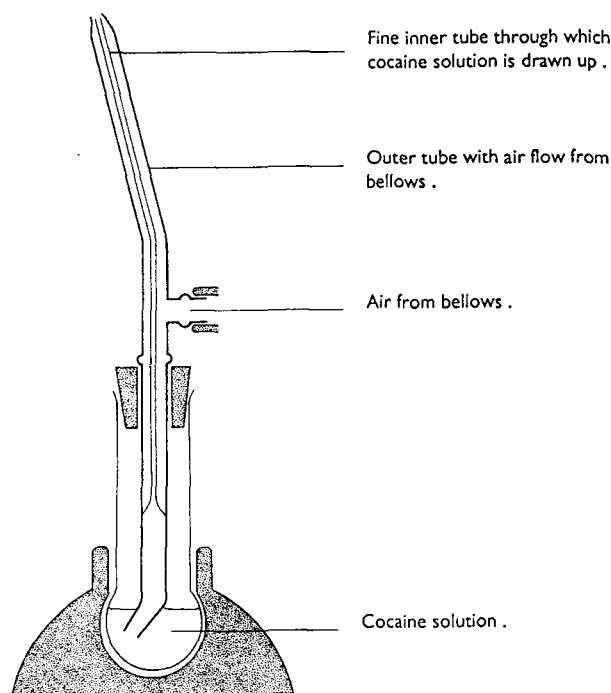


FIG. 2
Downs' atomiser (drawing).

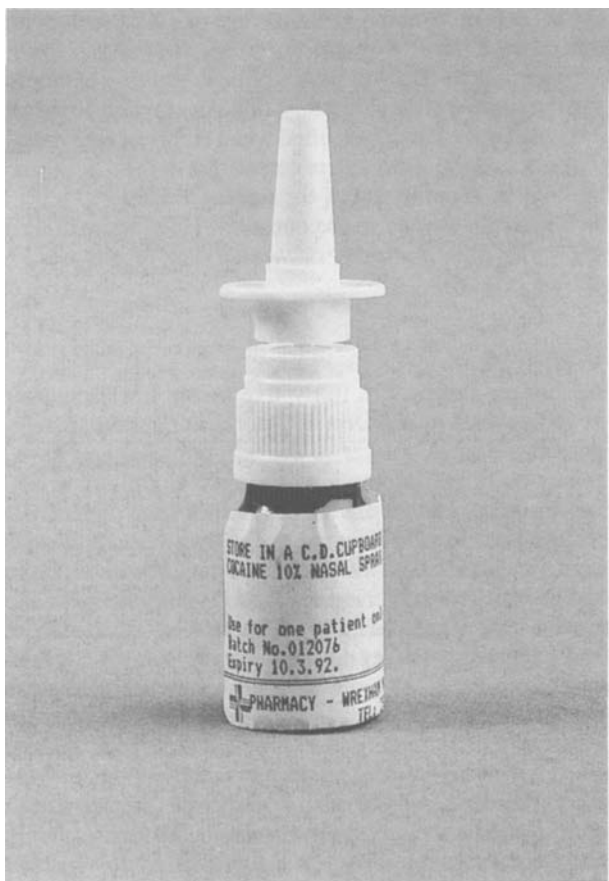


FIG. 3
Once only disposable nasal spray.

Number of patients	Number of ENT units
1	3
2	11
3	8
4	2
5	5
6	3
7	2
8	3
9	0
10	1

open at the nozzle where the outer tube is slightly tapered. The other end of the inner tube is connected to the fluid reservoir. As the bellows are squeezed it creates a fast flow of air in the outer tube, this has the effect of creating a negative pressure at the tip of the inner tube, which sucks fluid out of the container and a spray is formed. Suck-back occurs just as the bellows are released. A slightly negative pressure is created in the applicator which has a sucking effect at the tip of the nozzle. This momentary negative pressure occurs in both glass tubes so that air or fluid may be sucked back into either tube. If sucked into the inner tube it can mingle with the fluid already in the container. If it is sucked into the outer tube it can stay there until the bellows are again squeezed. It is impossible to clean the inside of these tubes effectively, due to design problems.

In order to effectively spray the nasal mucosa the tip of the atomiser has to be in the patients nostril, if it is not, the face will be sprayed. If the tip is still in the nose when the pressure is taken off the bellows, fluid in the nose may be sucked back into the atomiser. This may lead to body

fluids and infections being passed from one patient to another, if the same applicator is used for more than one patient. Because of this risk, we feel that a once only applicator should be used.

In Wrexham we have developed a once only disposable nasal spray (Fig. 3), to overcome this potential problem of cross-infection.

Method

To assess the size of the problem, we sent a questionnaire to the Senior Nurse in a hundred and ten ENT units throughout the country.

Results of the questionnaire

There were one hundred and five (95 per cent) replies to our questionnaire. Twenty of these (19 per cent) said they did not use cocaine sprays in their department. Some units said they used cocaine solution on cotton wool or ribbon gauze or cocaine paste. Of the twenty hospitals where a cocaine spray was not used, nine (45 per cent) said they used lignocaine spray instead. Thirty three (39 per cent) of those using cocaine said they also used lignocaine.

In Wrexham we have used the Downs' atomiser in the past and the rest of the questionnaire was about the Downs' atomiser. Of the one hundred and five, forty eight (46 per cent) said they used the Downs' atomiser. Most of the others who did not use the Downs' atomiser did not mention the type of spray used. Of the few who did mention it, seven (7 per cent) mentioned the Roger's spray and four (4 per cent) mentioned the Chiron spray. Both these sprays have the same problem with suck-back. No department mentioned a spray system which does not have a problem with suck-back.

When asked 'Do you have a policy for the number of times the Downs' spray is used on each patient?', forty two (76 per cent) of the fifty five (52 per cent) who answered this question said no. Of those who had a policy, three (5 per cent) said they recorded its use in the C.D.A.

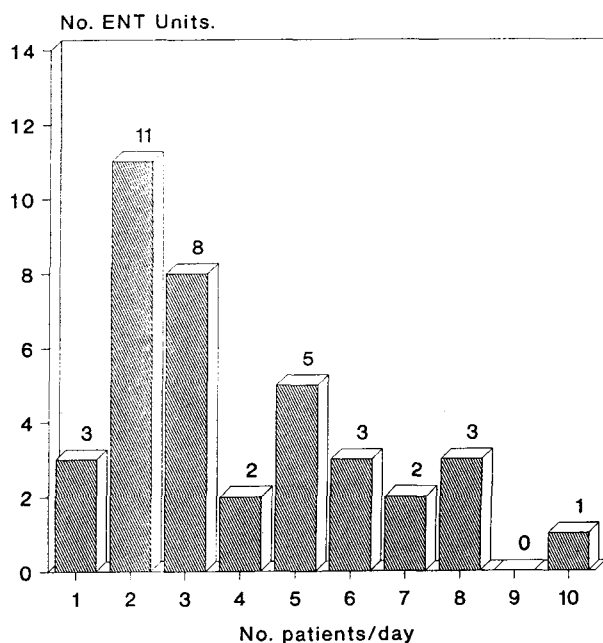


FIG. 4

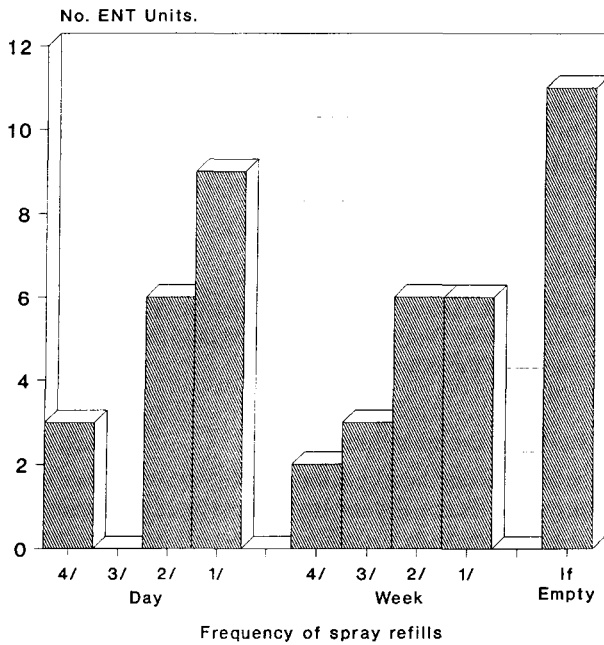


FIG. 5

How many times is the spray filled each day of week?

book, three (5 per cent) said they cleaned it after each patient. One unit (2 per cent) replied that they used the spray only once and then cleaned it with hydrogen peroxide. Another unit (2 per cent) said they used it only once per patient. Four (7 per cent) said they had a policy and using one to four puffs per patient. Finally, one (2 per cent) said they changed their sprays once a week.

Thirty eight units answered the question 'On how many patients is the spray used every day'? The results are

shown in (Fig. 4) and give an average of 3.8 patients being treated each day.

When asked 'Do you have a policy on filling or emptying the spray'? Nine said it was filled or emptied after each patient. Thirty said it was filled when empty or near empty. Twenty said the sprays were emptied at the end of the day, and two said at the end of the week.

Finally, in answer to the question 'How many times is the spray filled each day or week'? The results were as shown (Fig. 5).

Discussion

As Figure 4 indicates, thirty five of the ENT units surveyed were using the Downs' Atomiser on more than one patient a day. In answer to the question 'Do you have a policy on filling or emptying the spray'? Only nine ENT units said they filled or emptied it after each patient. The results therefore indicate that the Downs' atomiser is being widely used on more than one patient without cleaning in-between. It therefore appears, that there is a widespread lack of appreciation of the risk of cross infection and exchange of body fluids that may occur with these sprays.

In the light of the above problems we have developed a once only disposable nasal spray (Fig. 3), in Wrexham. We decided to look into the idea of using pump units, like those on commercially available aqueous steroidal nasal sprays, as an alternative to the Downs' atomiser. Although these plastic pump units are designed so that air drawn back into the solution does not come from the patient's nose, we found with experiments using dye solution that the inside of the plastic pump became contaminated with the dye (Fig. 6). As the inside of these pumps cannot be effectively cleaned out prior to sterilising and the cost of

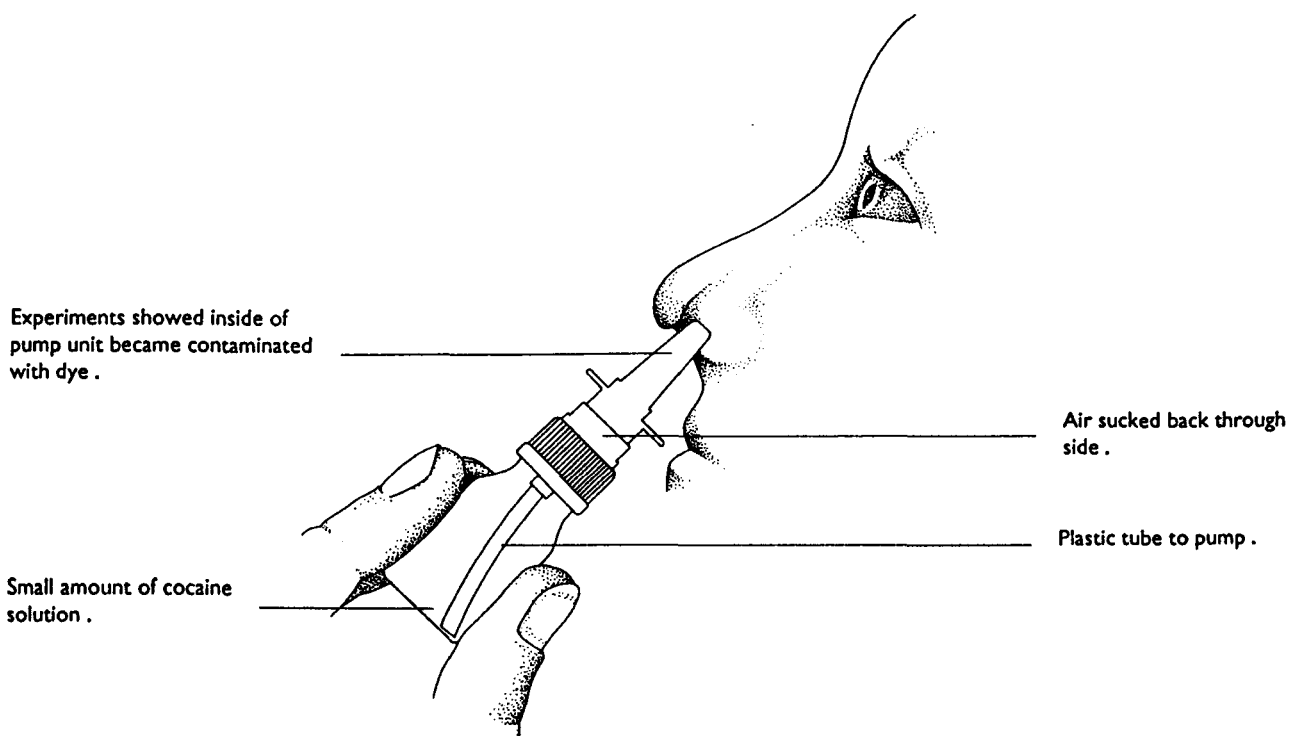


FIG. 6

Once only disposable nasal spray.

TABLE I
COST OF ONCE ONLY DISPOSABLE NASAL SPRAYS COMPARED WITH
COST OF USING DOWNS' ATOMISER

Average number of patients treated per month = 45	
Cost of old system	
Cocaine solution 10% 50 mls	= £19.26
50 ml glass ribbed bottle	= 7.2p
Downs' atomiser	= £22.50 each*
Pharmacy labour cost	= £ 5.00 per month
Cost per patient	= 79p
Cost of new system	
Cost of pump unit	= 29p
Cost of glass bottles	= 8.2p
Cost of 2 ml of cocaine solution 10%	= 77p
Pharmacy labour cost	= £22.00 per month
Cost per patient	= £1.58

*Use one every 2 months

sterilising would be more than the cost of the pump, we decided to use them for one patient only and then dispose of them.

Trials using these plastic pumps (VP3/140 18PH, Perfect-Valois UK Ltd) on 10 ml glass bottles showed that 2 mls of cocaine 10 per cent solution was adequate for all patients and avoided excessive waste of solution. Care needed to be taken to see that the tip of the plastic tube leading to the pump was in the solution, by correctly angling the bottle. The pump is then primed by one depression of the plunger, thereafter each successive depression of the plunger produces an excellent spray.

The cost per patient is £1.58p compared with 79p for the Downs' atomiser and takes into account the increased time required for packing of the cocaine in pharmacy (Table 1).

Conclusion

With the increase in prevalence of H.I.V. and M.R.S.A. infections it seems prudent to eliminate the risk of cross infection inherent in the Downs' Atomiser.

Current UK practice offers no alternative delivery systems that are as effective, but lack the cross infection hazard. Cocaine paste is difficult to dose and apply evenly and accurately. A spray remains the better method.

At Wrexham Maelor Hospital ENT Department a single use nasal spray of cocaine is now in use that provides acceptable local anaesthesia.

Acknowledgements

The authors would like to thank all the nursing staff on the ENT unit, in particular Mrs Heyward, Senior Nurse and Staff Nurse H. Griffiths for their help in implementing the changeover to the new sprays.

Mr S. Monk, M. R. Pharm.S. and Mr M. Oldcome, M.R. Pharm.S. for their pharmaceutical advice and technical support.

Sue Cull and Claire Lewis, Cartrefle College, Wrexham for their help with the illustrations.

Stephanie May for her help with the questionnaire and typing the manuscript.

Address for correspondence:
Mr J. F. Coakley,
Consultant ENT Surgeon,
Wrexham Maelor Hospital,
Wrexham,
Clwyd LL13 7TD