Nasal masks for domiciliary positive pressure ventilation: patient usage and complications

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Abstract

Background – Nasal mask discomfort is a major factor in compliance with treatment by nasal intermittent positive pressure ventilation (NIPPV) and nasal continuous positive airway pressure (CPAP). Methods – A study of skin complications resulting from mask usage, with particular reference to predisposing factors, was carried out in 66 patients by means of a postal questionnaire. An effective means of managing ulceration at the nasal bridge while continuing therapy is described. Results – Some disruption of treatment due solely to mask discomfort was experienced by 35 patients (53%), consisting of broken skin or open sores in 11 cases (17%). Conclusions – Although complications resulting from nasal mask usage are common, early identification of patients at risk of developing such complications and appropriate intervention will result in improved patient compliance.

(Thorax 1994;49:811–812)

Nasal intermittent positive pressure ventilation (NIPPV) and nasal continuous positive airway pressure (CPAP) are widely used in the domiciliary treatment of chronic ventilatory disorders, with ventilation being delivered through tightly fitting nasal silicone masks.1 The success of all forms of non-invasive ventilatory support depends on long term compliance with treatment, and patient acceptance of the interface – in this case the nasal mask – is an important component of this.7 Various forms of mask have been used,8 but all types may be associated with problems of leakage or discomfort.6,9,10 In particular, regular use of a nasal mask may cause local skin irritation or breakdown,11 although the incidence of ulceration has not been previously reported. Other complications such as nasal congestion or dryness of the nose and throat are common, but these normally respond well to topical therapy and rarely cause significant disruption of treatment.9

We report a survey of nasal mask usage and local skin complications, with particular regard to predisposing factors, in patients established on long term domiciliary NIPPV or nasal CPAP. We also report a novel method of dealing with severe mask discomfort and complications.

Methods

All 66 patients (46 men, 20 women of median age 55 (range 21–75) years) using NIPPV or nasal CPAP at our unit through the Respironics nasal mask (Respironics Inc, Monroeville, Pennsylvania, USA) were studied by means of a detailed postal questionnaire. Questions were asked about disruption of treatment, local skin problems due to the nasal mask and their management, and concurrent therapy. Patient hospital case notes were also reviewed. All 26 patients treated with NIPPV and 40 with CPAP responded. The median duration of treatment was 16 months (range 2–60) and the stated median daily use of the nasal mask was seven hours (range 3–13).

Results

Thirty five patients (53%) experienced some disruption of treatment due solely to mask comfort; 16 (24%) experienced disruption of treatment on one or more nights per week, with four patients having to curtail therapy every night. Complications were classified as major (broken skin or open sores) and minor (persistent red or painful areas of skin). Eleven patients (17%) reported major problems, and in four skin ulceration was present for more than four weeks. A further 25 patients (38%) reported minor problems. Twenty patients had started using a nasal mask during acute exacerbations of their condition (acute start), of whom two developed major problems. The remaining 46 patients started to use the mask during stable periods (chronic start), and of these four developed major mask problems in the early treatment period. Both groups subsequently continued to use nasal masks on a long term basis. There was no significant difference between patients starting therapy acutely or chronically in terms of the likelihood of developing major or minor complications due to nasal mask use. Of the 14 patients in this survey who used maintenance oral steroids five developed major problems compared with six of 52 patients not
using regular steroid therapy. This difference was statistically significant (p=0.05). These results are summarised in the table.

PREVENTION AND MANAGEMENT OF NASAL MASK COMPLICATIONS

To improve mask fitting 24 patients used the foam wedges provided with the mask and four had inserted additional cloth padding around the rim of the mask. Two patients were using patches of Granuflex (Convatec Ltd), a hydrocolloid dressing originally developed for the treatment of pressure sores, on the nasal bridge. For patients with minor skin problems this form of dressing provides satisfactory protection to the nasal bridge; however, such patches frequently cause mask leaks, often directly into patients' eyes, which limits their usefulness.

For those patients with persistent ulceration of the nasal bridge we have developed individually moulded Silastic mask prostheses using a proprietary preparation, Otoform K2 (P C Werth Ltd, London, UK). This preparation has two components: a silicone paste and a catalytic hardening agent which are mixed together to form a malleable compound that can be applied directly to the skin and moulded to the desired shape in situ, later hardening to form a flexible pad which retains its shape permanently (figure). The nasal mask is applied to the pad during the moulding process so that the finished Silastic pad bears impressions of the patient's nasal bridge on one side and the nasal mask on the other. The edges of the Silastic can be moulded around the edges of the mask to prevent leakage. The whole process takes about 30 minutes. Using this technique, all patients with persistent skin problems experienced complete resolution of ulceration within four weeks without further disruption of treatment and were able to continue long term therapy. Of the four patients in whom this technique has been used to date, two have

continued to use the mask and prosthesis for more than six months without further problems, one used the prosthesis successfully for five months until nasal ventilation was discontinued for unrelated reasons, and one used the prosthesis for four weeks until complete resolution of ulceration had occurred.

Discussion
Cutaneous complications of nasal mask usage are common and may lead to disruption of treatment in a significant proportion of patients undergoing long term therapy with NIPPV or nasal CPAP. In this study over half of the patients had to curtail treatment on a regular basis solely because of mask discomfort, with 24% of the patients interrupting therapy on one or more nights per week. Furthermore, 17% of patients developed skin breakdown at the nasal bridge and a small number developed chronic ulceration at this site. Patients on maintenance oral steroids are at particular risk of developing persistent ulceration.

In our unit, however, individual attention to problems and the development of effective mask prostheses has led to resolution of complications and rapid healing of ulceration in all cases with a consequent restoration of effective therapy. We believe that early identification of those patients at greatest risk of developing nasal mask complications and appropriate intervention will lead to an improvement in patient compliance and greater long term efficacy of domiciliary ventilatory support.

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Summary of nasal mask complications

<table>
<thead>
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<th>Complications</th>
<th>n</th>
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<th>Minor</th>
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<tr>
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<td>11</td>
<td>25</td>
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<td>2</td>
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<td>13</td>
<td>15</td>
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<tr>
<td>Maintenance steroids</td>
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<tr>
<td>No steroids</td>
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<td>6</td>
<td>20</td>
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*p=0.05.