Short papers

Comparison of nose and face mask CPAP therapy for sleep apnoea

I L Mortimore, A T Whittle, N J Douglas

Abstract

***Background*—Many patients with sleep apnoea/hypopnoea syndrome (SAHS) find nasal continuous positive airway pressure (CPAP) treatment unsatisfactory due to side effects related to mouth air leakage. A study was performed to compare side effects with face mask and nose mask CPAP therapy in patients with SAHS, with and without uvulopalatopharyngoplasty (U3P).**

***Methods*—Twenty newly diagnosed patients with SAHS took part in a randomised double limb trial of face or nose mask CPAP therapy (four weeks per limb) in which CPAP compliance in terms of machine run time was measured and patients answered a symptom questionnaire on side effects resulting from the mask. Ten patients with SAHS with U3P (SAHS/U3P) who were already regular users of nasal CPAP were also given a four week trial of face mask CPAP to compare compliance and symptoms. Ten patients with SAHS were matched with the 10 SAHS/U3P patients for body mass index, age, apnoea/hypopnoea index, and CPAP pressure. Long term compliance was estimated one year after the mask comparison studies.**

***Results*—For patients with SAHS nightly compliance was higher with a nose mask (mean (SE) 5.3 (0.4) hours/night CPAP) than with a face mask (4.3 (0.5) hours/night CPAP), p = 0.01 (mean difference 1.0 hour/night, 95% CI 1.8 to 0.3). Nose masks were rated more comfortable by 19 of 20 patients (p<0.001) despite more mouth leak related symptoms. For SAHS/U3P patients compliance was marginally higher with nose masks (5.1 (0.7) hours/night CPAP) than with face masks (4.0 (0.8) hours/night CPAP), p = 0.07 (mean difference 1.1 hour/night, 95% CI 2.1 to 0.1). Nose masks were rated more comfortable by seven of 10 patients. There were no significant differences in side effect scores with face and nose masks. At one year nine of 10 SAHS patients and nine of 10 SAHS/U3P patients were still using CPAP. Compliance was 5.4 (0.6) hours/night for the SAHS patients and 3.5 (0.4) hours/night for the SAHS/U3P patients, p = 0.02 (mean difference 1.9 hour/night, 95% CI 3.6 to 0.3).**

***Conclusions*—Compliance is greater with nose mask CPAP than with face mask CPAP because the overall comfort is better and compensates for increased symptoms associated with mouth leakage. Improved face mask design is needed.**

(*Thorax* 1998;**53**:290–292)

Keywords: continuous positive airway pressure; sleep apnoea/hypopnoea syndrome; face masks

Respiratory Medicine Unit, Department of Medicine, University of Edinburgh, Royal Infirmary, Edinburgh EH3 9YW, UK
I L Mortimore
A T Whittle
N J Douglas

Correspondence to:
Dr I L Mortimore, Scottish National Sleep Laboratory, Royal Infirmary, Edinburgh EH3 9YW, UK.

Received 18 April 1997
Returned to authors 30 June 1997
Revised version received 10 December 1997
Accepted for publication 12 December 1997

Continuous positive airway pressure (CPAP) therapy for sleep apnoea/hypopnoea syndrome (SAHS) is traditionally given via a nose mask. However, many patients with SAHS find this method of treatment unsatisfactory, often due to symptoms related to mouth air leakage.[1] Patients who have had unsuccessful uvulopalatopharyngoplasties (U3P) for treatment of SAHS are particularly likely to experience increased mouth leakage on nasal CPAP which is associated with reduced nightly compliance.[2] The CPAP pressure required is essentially the same for nose masks and face masks,[3] so face masks which cover both nose and mouth may be advantageous if they reduce the symptoms associated with mouth leakage.

We have compared nose and face mask CPAP therapy with respect to side effects from the mask and compliance in newly diagnosed patients with SAHS in a randomised double limb trial. We also compared nose and face mask CPAP in patients with unsuccessful uvulopalatopharyngoplasties for treatment of SAHS (SAHS/U3P patients).

Methods

All subjects gave informed consent to take part in the study.

RANDOMISED TRIAL

Twenty consecutive newly diagnosed patients with SAHS (mean (SE) apnoea/hypopnoea index 34 (5.2)/hour, age 52 (3) years, body mass index 32 (1) kg/m^2, CPAP pressure 9 (1) cm H_2O) were enrolled into the study after their CPAP titration night. Initial CPAP titration was performed using a nose mask. Patients were randomised to face mask or nose mask CPAP for four weeks each. At the end of

Table 1 Median symptom scores for face mask (FM) and nose mask (NM) CPAP therapy in patients with sleep apnoea/hypopnoea syndrome (SAHS) with and without uvulopalatopharyngoplasty (U3P)

	SAHS patients (n=20)			*U3P/SAHS patients (n=10)*		
	FM	*NM*	*p value*	*FM*	*NM*	*p value*
Daytime sleepiness	2.0	1.5	0.07	3.9	3.5	0.1
Mask comfort	1.1	6.5	0.001	2.1	6.7	0.06
Sore nasal bridge	1.0	2.0	0.06	2.0	2.0	0.9
Nasal stuffiness	1.5	1.0	0.7	1.5	3.5	0.1
Dry throat/mouth	1.0	2.0	0.03	2.5	4.6	0.4
Dry nose	0	1.5	0.05	2.7	3.6	0.3
Mask leak	6.0	1.0	0.003	6.3	2.6	0.3
Red/sore eyes	1.4	0	0.02	2.0	2.0	0.2
Snoring	0	0.5	0.4	1.1	2.1	0.3
Claustrophobia	4.0	0	0.0004	2.5	0.5	0.6
Difficulty exhaling	1.0	0	0.04	0.5	2.0	0.6

each limb subjects were asked to complete a questionnaire on side effects relating to the mask (10 cm visual analogue scale) and the Epworth sleepiness score.[4] CPAP compliance was also assessed covertly as CPAP machine (Sullivan III, Resmed, Sydney, Australia) run time (hours/night).

NON-RANDOMISED TRIAL

Ten SAHS patients with U3P (mean (SE) apnoea/hypopnoea index 46 (10)/hour, age 50 (3) years, body mass index 31 (4) kg/m^2, CPAP pressure 10.5 (1) cm H_2O) who had recently started nose mask CPAP therapy were offered face mask treatment for four weeks. Prior to starting face mask CPAP patients completed the symptom questionnaire and compliance with nose mask CPAP was measured. At the end of the face mask trial period they completed the symptom questionnaire and CPAP compliance was calculated.

COMPARISON OF LONG TERM COMPLIANCE

Ten patients with SAHS from the randomised trial were matched with the 10 SAHS/U3P patients for age (p = 0.3), body mass index (p = 0.6), apnoea/hypopnoea index (p = 0.2), and CPAP pressure (p = 0.3). These patients were followed up for one year after the randomised and non-randomised trials so that long term compliance could be assessed.

MASKS

Patients were offered either Resmed (Sydney, Australia) or Respironics (Pennsylvania, USA) nose masks. Face masks were Respironics. Masks were fitted/sized in the laboratory and patients were given a day time trial of CPAP for approximately 40 minutes in order to facilitate mask choice.

FOLLOW UP

All patients were followed up in the sleep clinic/laboratory after CPAP titration using the same protocol by staff who were unaware of the trials. Additional supportive measures including changing mask sizes were taken if appropriate during follow up in an effort to maximise compliance.

ANALYSIS OF RESULTS

Comparisons were made using *t* tests or Wilcoxon matched pairs signed rank tests as appropriate.

Results

RANDOMISED TRIAL

Median nose and face mask questionnaire symptom scores are shown in table 1. Nightly compliance by patients with SAHS was higher with a nose mask (5.3 (0.4) hours/night) than with a face mask (4.3 (0.5) hours/night), p = 0.01 (mean difference 1 hour/night, 95% CI 1.8 to 0.3) and the Epworth score was lower with nose mask CPAP (nose mask 8.2 (0.9) and face mask 9.8 (0.9), p<0.01). Face masks were rated more comfortable by only one of the 20 subjects.

NON-RANDOMISED TRIAL

Questionnaire symptom scores with nose and face masks for SAHS/U3P patients are shown in table 1. Nightly compliance was higher with nose masks (5.1 (0.7) hours/night) than with full face masks (4.0 (0.8) hours/night), but the difference was not statistically significant, p = 0.07 (mean difference 1.1 hour/night, 95% CI 2.1 to 0.1). The Epworth score was no different between nose and face masks (face mask 10 (2), nose mask 9 (1), p = 0.9). Full face masks were rated more comfortable by three of the 10 subjects.

COMPARISON OF LONG TERM COMPLIANCE

At one year one patient from each group had stopped using CPAP. All nine patients with SAHS on CPAP therapy were using a nose mask and only one of the SAHS/U3P patients was using a full face mask. Compliance was 5.4 (0.6) hours/night for the SAHS patients and 3.5 (0.4) hours/night for the SAHS/U3P patients, p = 0.02 (mean difference 1.9 hours/night, 95% CI 3.6 to 0.3).

There were no significant weight changes in any of the groups during the trial periods.

Discussion

Overall, for the 20 SAHS patients face mask use significantly reduced complaints of dry mouth/nose but at the expense of more problems associated with air leaks from around the edge of the mask and increased feelings of claustrophobia. Nose masks were rated significantly more comfortable than face masks with 19 patients with SAHS preferring nose mask CPAP therapy. The lone patient preferring face mask CPAP had significant problems with mouth leakage using nose masks.

Three of 10 SAHS/U3P patients preferred face mask CPAP therapy. Symptoms of mouth leakage were marginally reduced by face masks compared with nose masks (table 1) but symptoms associated with mask comfort were worse and presumably contributed to the overall mask preference. In addition, most of the patients had been on nose mask CPAP therapy for longer than the four weeks of the face mask trial which probably served to enhance the rating of the nose masks.

After one year of follow up all the SAHS patients had used nose masks exclusively and demonstrated significantly better compliance than matched SAHS/U3P patients which is consistent with our previous findings.[4] Eight of

nine SAHS/U3P patients used nose masks exclusively during this period.

There were no incentives to enter the trials and SAHS/U3P patients were not aware of CPAP therapy at the time of operation and therefore were not initially biased against CPAP therapy.

We conclude that, despite the potential advantages of face masks in terms of reduction in mouth leak associated symptoms, nose masks are more comfortable than currently available face masks and overall symptom scores are therefore better with nose masks. Face mask CPAP therapy is, however, a useful alternative in a few patients. Face mask use does not seem to resolve completely the problem of decreased CPAP compliance in SAHS/U3P patients. Improved face mask design in future may overcome this limitation.

This study was funded by the Wellcome Trust.

1 Engleman EM, Martin SE, Deary IJ, *et al*. Effect of CPAP therapy on daytime function in patients with mild sleep apnoea/hypopnoea syndrome. *Thorax* 1996;**52**:114–9.
2 Mortimore IL, Bradley PA, Murray JAM, *et al*. Uvulopalatopharyngoplasty may compromise nasal CPAP therapy for sleep apnea. *Am J Respir Crit Care Med* 1996;**154**:1759–62.
3 Prosise GL, Berry RB. Oral-nasal continuous positive airway pressure as a treatment for obstructive sleep apnea. *Chest* 1994;**106**:180–6.
4 Johns MW. A new method for measuring daytime sleepiness: the Epworth sleepiness scale. *Sleep* 1991;**14**:540–5.

Thorax; 1998;**53**:292–294

Reduced mortality in association with the acute respiratory distress syndrome (ARDS)

S J C Abel, S J Finney, S J Brett, B F Keogh, C J Morgan, T W Evans

Ab stract

***Background*—A study was undertaken to investigate possible reductions in mortality and/or changes in outcome predictive factors in patients with the acute respiratory distress syndrome (ARDS) managed in a single centre.**

***Methods*—The study was a prospective observational cohort study of two patient populations with ARDS. Group 1 comprised 41 patients enrolled between May 1990 and April 1993, and group 2 consisted of 78 patients enrolled between June 1993 and March 1997. The end points of the study were mortality and various factors predictive of death.**

***Results*—There was a marked reduction in mortality between groups 1 and 2 (66% versus 34%; relative risk 1.77; CI 1.23 to 2.55). There were no significant differences between the groups in terms of age (40.6 (3.3) versus 45.5 (2.2) years), APACHE score (14.5 (0.72) versus 13.6 (0.1)), lung injury score (2.95 (0.07) versus 2.8 (0.1)), incidence of multi-organ failure (29% versus 32%), incidence of sepsis (31% versus 39%), or Pao_2/FIO_2 (kPa) ratio (11.8 (0.67) versus 12.0 (0.6)). There was a significantly lower proportion of men in group 1 (51% versus 74%). The case mix of the two groups was closely matched: following elective surgery 48% versus 48%, trauma 17% versus 16%, primary lung injury 12% versus 24%. Patients in group 1 were supported using several ventilatory and other modes (volume preset, non-inverse ratio ventilation, n = 15; pressure controlled inverse ratio ventilation (PC-IRV), n = 11; ultra high frequency jet ventilation (UHFJV), n = 13; an intravascular oxygenation device (IVOX) and extracorporeal gas exchange (ECGE), n = 2). Within group 1 no significant difference in mortality was observed between the patients on volume controlled ventilation and the remainder. In group 2 all patients received PC-IRV (n = 78) but, in addition, some received other support techniques (UHFJV n = 4, ECGE n = 2). In group 1 only sepsis on admission (21% (survivors) versus 56% (non-survivors)) predicted death. In group 2 age of survivors and non-survivors (41.2 (2.6) versus 52.6 (3.5)), APACHE score (12.2 (0.6) versus 15.8 (0.9)), and Pao_2/FIO_2 (12.8 (0.86) versus 10.5 (0.72)) predicted survival, but not the incidence of sepsis or multi-organ failure.**

***Conclusions*—In recent years a highly significant reduction in mortality associated with ARDS has been observed between two groups of patients well matched for disease severity and case mix. Changes in ICU organisation rather than specific interventions may account for this reduction, although different ventilatory and other management strategies used in the two groups may also be relevant.**

(*Thorax* 1998;**53**:0–0)

Keywords: acute respiratory distress syndrome (ARDS); prognosis; outcome

Unit of Critical Care, Imperial College School of Medicine, Royal Brompton Hospital, London SW3 6NP, UK
S J C Abel
S J Finney
S J Brett
B F Keogh
C J Morgan
T W Evans

Correspondence to:
Professor T W Evans.

Received 7 July 1997
Returned to authors 9 September 1997
Revised version received 13 October 1997
Accepted for publication 28 October 1997

The acute respiratory distress syndrome (ARDS) in adults is characterised by refractory hypoxaemia in the presence of radiographic evidence of bilateral pulmonary infiltration. ARDS may be precipitated by a number of direct and indirect pulmonary insults. A survey of the relevant literature suggests that little