

Computer imaging and patient satisfaction in rhinoplasty surgery

H. R. SHARP, F.R.C.S., R. S. TINGAY, B.Sc. *, S. COMAN, F.R.A.C.S., V. MILLS, B.Sc. *,
D. N. ROBERTS, F.R.C.S. (ORL-HNS)

Abstract

The measurement and achievement of improved patient benefit following a particular medical or surgical intervention has become an increasingly relevant part of the provision of effective healthcare.

We have retrospectively analysed patient satisfaction in 56 patients following rhinoplasty via the Glasgow Benefit Inventory (GBI), 25 of whom underwent pre-operative computer imaging planning. We have also audited patient reaction to this technique via a concurrent questionnaire in those subjects who underwent imaging, and correlated this with overall patient outcome.

Patient satisfaction with cosmetic rhinoplasty following computer imaging was significantly improved compared to those patients who did not receive imaging.

Key words: Computers; Photography; Rhinoplasty

Introduction

Patient satisfaction following any surgical procedure can be defined as the patient's perceived improvement in well-being following the intervention. It is particularly important in the realms of facial plastic surgery that patients have clear and realistic pre-operative expectations arising from appropriate communication and planning, and that surgeon and patient have a mutual understanding of the desired surgical result.¹ Standard view photographs in the frontal, basal, left and right oblique and profile views are widely accepted as a means of pre-operative documentation and surgical planning. These images are not easily manipulated however, and even when adjustments are 'drawn on' by the surgeon it is difficult for most patients to visualize their post-operative appearance.² Other means of demonstrating proposed surgical changes include large scale slide projected images, facial casts and soft tissue cephalometric measurements. These complex and time-consuming techniques suffer from practical disadvantages that have precluded widespread acceptance, particularly in the constraints of the National Health Service (NHS).

Computer imaging is a technique designed to enhance pre-operative communication, analysis and planning in facial plastic surgery. Computer software allows modification of nasal characteristics to be affected upon standard pre-operative digitalized images of the patient's face. Programmes that were

exclusively developed for use in facial plastic surgery first emerged in 1987, and since this time cheaper, more efficient and user-friendly packages have emerged with expanded applications.³

Clinical analyses of computer imaging in rhinoplasty have indicated that the predicted results correlate well with the actual post-operative appearance.^{1,4} Patients have suggested that the technique facilitated communication, enhanced the doctor-patient relationship and improved confidence in the surgeon.^{1,2}

Patient orientated outcome measures enable analysis of the effectiveness of an intervention and thus enable comparisons to be drawn between different individual procedures. The GBI was developed as a specific measure of the effect of Otorhinolaryngological interventions. It is a validated post-procedure questionnaire designed to measure changes in health status, where this is defined as a general perception of well-being as well as total psychological, social and physical health.⁵ We have measured patient satisfaction via the GBI and audited patient views on computer imaging by means of a similar questionnaire to that employed in a previously published series.¹ In addition we have sought to analyse the effect of computer imaging on overall patient benefit by comparing GBI scores on patients who had pre-operative imaging and those who did not.

Materials and methods

Computer imaging

The equipment used consisted of a Compaq notebook computer with a Pentium 3 processor and a RGB flat screen monitor. Standard pre-operative digital images (basal, frontal, left and right oblique and profile views) were acquired using a Nikon Coolpix 950 (105 mm) digital camera with manual focusing. This was synchronized with studio lights and a pale blue background used. All the views obtained were manipulated in the presence of the patient via a cursor utilizing the MGI photosuite II image manipulation system until the desired surgical goal was established. This process involved on-screen reduction or augmentation of the various nasal characteristics in all the views. The images obtained were then stored in the senior author's (DNR) database, but were not routinely distributed to the patient.

Patient group

Seventy-three consecutive patients that had undergone rhinoplasty for functional, cosmetic or both reasons (Table I) under the care of DNR between 1999 and 2001 were retrospectively studied. All these patients had been counselled pre-operatively and been operated on by DNR personally. The age range of the patients was between 19 and 59 years (mean 35 years).

All 73 patients were contacted over a three week period by one of two of the authors (RT or VM) and 56 (76.7 per cent) of the cohort participated in the study. The group that participated were on average nine months following surgery (range six to 24 months). Of the 17 patients that did not participate, six declined to be involved and 11 were untraceable.

Twenty-five of the patients (45 per cent) had undergone pre-operative computer imaging (termed group A), while 31 (55 per cent) had not (termed group B). Digital computer imaging is not available in the senior author's NHS practice and thus all patients in group A were exclusively undergoing care in the private sector, and all those in group B were NHS patients.

The GBI (Table II) was used in all patients and an additional series of questions were used in group A pertaining to their views on the effect of the imaging. A Mann-Whitney U test was performed on the data using a SPSS statistical package, with statistical significance being taken as a *p* value less than 0.05.

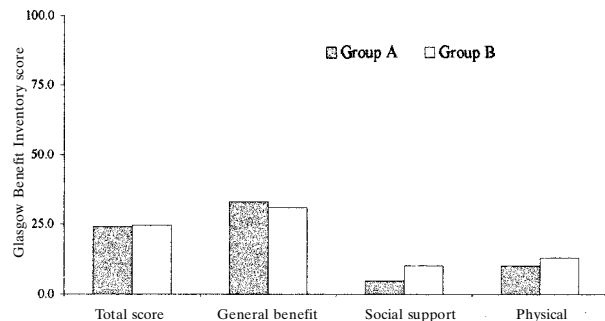


FIG. 1

Overall patient satisfaction of Group A versus group B.

Results

Computer imaging questionnaire (Table III)

Doctor-patient relationship. (Question 1 and 2) No patient that underwent computer imaging felt that it jeopardized the doctor-patient relationship, and 100 per cent of patients thought that the process actually enhanced it.

Confidence in the surgeon. (Questions 3 and 10) Eighty-four per cent of patients who were imaged found it easier to commit to the rhinoplasty procedure, and 56 per cent found that it enhanced their confidence in the surgeon's judgement.

Communication. (Questions 5, 6, 9 and 9a) Eighty-four per cent of patients found that the experience of computer imaging was beneficial in helping them to communicate their expectations and wishes to the surgeon. Only eight per cent felt that they had abandoned any of the surgical changes they had considered during the imaging session. Thirty-two per cent of patients said that there had been modifications suggested during the imaging that they had not previously considered, and 20 per cent adopted these changes.

Predictability. (Questions 4, 7 and 8) Forty-four per cent thought that the surgical result achieved was more aesthetic than the computer generated image, and 32 per cent thought it less aesthetic. One can conclude that the remaining 24 per cent felt that the surgical result was as expected.

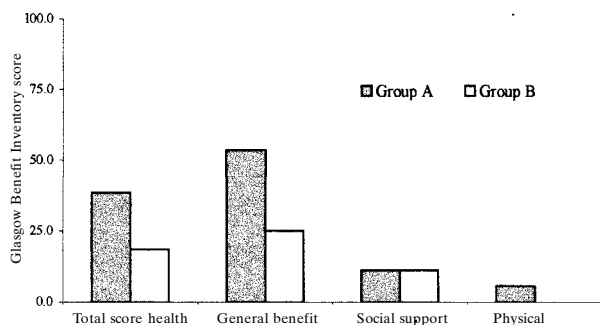


FIG. 2

Patient satisfaction in the subgroup of patients undergoing rhinoplasty surgery for cosmetic reasons in Group A and Group B.

TABLE I

BREAKDOWN OF PATIENT NUMBERS BY INDICATION FOR SURGERY

Group	Functional	Cosmetic	Both
A	10	6	9
B	8	3	20

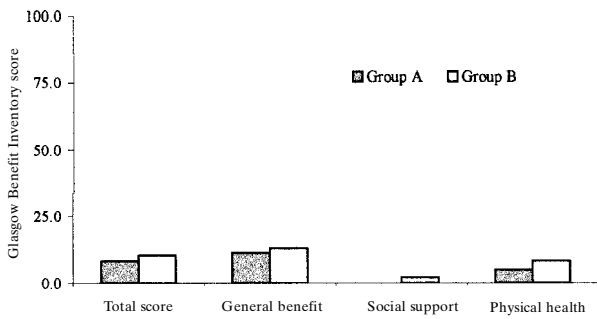


FIG. 3

Patient satisfaction in the subgroup of patients undergoing rhinoplasty surgery for functional reasons in Group A and Group B.

Glasgow Benefit Inventory

The GBI comprises of 18 questions designed to measure changes in health status. The score ranges from -100 (maximal harm) through 0 to +100 (maximal benefit).⁵ The questions are divided into categories assessing general benefit to the patient as well as the physical and social aspects of surgical benefit. Our data are represented graphically in Figures 2 to 5.

In the comparison between group A and B, we found that the cosmetic sub-group in A had a significantly higher score than the cosmetic patients in group B.

Discussion

The objective of modern rhinoplasty surgery is to achieve an individualized nose which is aesthetically concordant with the patient’s facial characteristics.⁶ Computer imaging allows subtle variation of form to be affected upon the patient’s image before a surgical goal is agreed upon. Harris^{7,8} has characterized patients requesting rhinoplasty as having an especially high degree of self-consciousness with respect to their appearance, and suggests that such patients have higher levels of expectation from surgery. This emphasizes the need for frank and open dissection with patients undergoing facial plastic surgery, and for clear and achievable goals

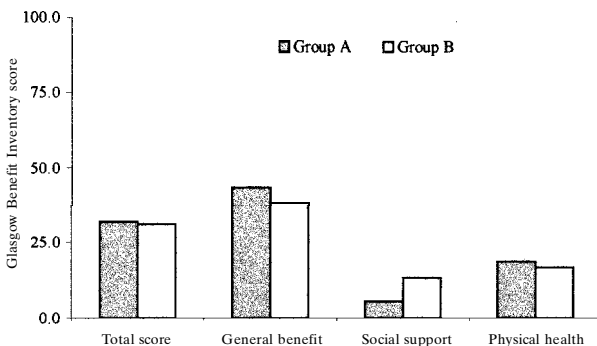


FIG. 4

Patient satisfaction in the subgroup of patients undergoing rhinoplasty surgery for both cosmetic and functional reasons in Group A and Group B.

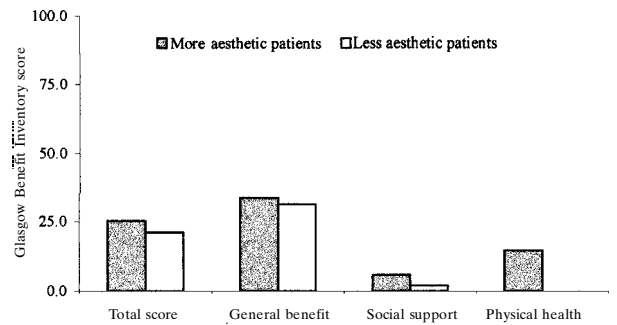


FIG. 5

Average GBI scores for the ‘more aesthetic’ versus ‘less aesthetic’ patients.

to be established pre-operatively. In our view any means of facilitating this process warrants consideration, and the purpose of our study was to see if this ability to more precisely ‘individualize’ a patient’s nose would lead to an overall improvement in patient satisfaction following rhinoplasty.

The result of the computer-imaging questionnaire suggest that this technique is well regarded by patients. All of the patients surveyed felt it enhanced doctor-patient communication, and the majority of patients (84 per cent) found it beneficial in communicating their wishes and expectations. In addition, surgical changes not previously considered by 32 per cent of patients were proposed by the surgeon during computer-imaging sessions and previously considered changes were abandoned by a proportion of patients (12 per cent) once discussed with the benefit of this facility. Fifty-six per cent of patients felt that their confidence in the surgeons had improved after the imaging session. These favourable patients responses supporting improved perceived doctor-patient relationship, communication and confidence with this technique are similar to those of Thomas *et al.*² and Vuyk *et al.*¹

It is interesting to note that not all patients that underwent imaging eventually consented to rhinoplasty. It has been suggested by Vuyk *et al.*¹ that this technique may help to identify patients with unrealistic expectations or psychological morbidity at an early stage, to allow surgery to be cancelled if thought inappropriate. We believe that this effect of the technology on the improvement of patient selection may help eventual overall patient satisfaction still further.

With respect to predictability, 64 per cent of patients found the post-operative result equally or more aesthetic than predicted but 32 per cent felt that the surgical result was less aesthetic than the

TABLE II
EXAMPLES OF QUESTIONS USED IN THE GLASGOW BENEFIT INVENTORY

Since your rhinoplasty operation:
Do you feel better or worse about yourself?
Do you feel that you have more or less support from your friends?
Have you been to your doctor more or less often?

TABLE III

QUESTIONNAIRE USED TO ANALYSE THE ROLE OF COMPUTER IMAGING IN RHINOPLASTY SURGERY

1. Do you think that computer imaging is jeopardising the personal aspect of the patients-surgeon relationship?
2. Do you feel the personal aspect is enhanced by computer-imaging?
3. Did you find it easier to commit to facial surgery after your imaging session?
4. Do you think that the computer-imaging prediction is fulfilled by the surgical result?
5. Do you think that computer-imaging is beneficial in communicating your wishes and expectations?
6. Did you abandon any certain surgical changes, you had previously considered, after your imaging session?
7. Do you think that the surgical result is more aesthetic than the predicted computer generated image?
8. Do you think that the surgical result is less aesthetic than the predicted computer generated image?
9. Were any potential surgical changes proposed during the computer-imaging session, previously not considered on your part?
 - 9a Did you adopt these changes?
 - 9b Are you satisfied with them?
10. Did you have more confidence in the surgeon's judgement after your imaging session than before it?

Adapted from Vuyk *et al.*¹

computer image created. This is somewhat higher than the 17 per cent in the study by Vuyk *et al.*¹ Although this may relate to surgical technique, it could at least be partly explained by difference in computer imaging technique. In the Dutch study a profile view only was used but in our study we used all views (basal, oblique, frontal and profile) in most patients, which we believe gives the patient a more realistic and comprehensive impression of the planned surgical changes. The use of multiple views does however create a greater potential for discrepancy between image and surgical result. In addition, prints were not sent to the patients and so we were relying on patients to remember their modifications. It is interesting to note that in this group of patients who felt that their surgical result was less aesthetic than predicted, the overall satisfaction scores compared favourably with the average score (Figure 6). Thus failure to surgically attain the 'ideal' nose generated by the computer image does not necessarily result in poor overall patient satisfaction.

Both groups of patients scored well in the GBI, with overall scores of 24 in the imaged and 24.5 in the non-imaged groups. These figures are comparable to an average GBI of 24 in the cohort identified as having a successful outcome from rhinoplasty surgery by Robinson *et al.*⁵

There was no statistically significant difference in the indications for surgery between group A and group B ($p = 0.110$ via Fishers' exact test – $p = 0.09$ via Chi squared test), and there was no statistical difference in overall satisfaction between the two groups. If the patients are further stratified on the basis of indication for surgery, in those patients who had a purely cosmetic indication for surgery the imaged group scored statistically significantly higher in general benefit (53.5 compared to 25.0) than the non-imaged group (Figure 3). There was no statistically significant improvement in benefit in the group undergoing rhinoplasty for functional reasons or for a combined functional and cosmetic indication. This may be because the difference in satisfaction between these subgroups is smaller and may become more evident as the numbers of patients studied rises in the future.

This pilot study is retrospective and the numbers of patients is small, but as the survey continues prospectively statistical power will increase and the

overall chance of statistical error fall. The patients in the two groups are from different healthcare modalities, and there are inevitable time constraints in the NHS system that are not as inherent in the private sector. In optimal conditions, we would randomize the patients to the imaging or non-imaging groups and the two groups would be age and sex matched. This was not achievable as the imaging equipment is not available at present in the NHS, and the elimination of this element of possible selection bias not therefore possible.

One could argue that the expectations of patients in the private sector (and thus in the group that had imaging in our survey) are greater and the likelihood of their being satisfied therefore decreased. The overall results in this survey are, however, comparable to previous similar studies.⁵

Despite the shortcomings mentioned it is important to emphasize that all subjects in both groups were counselled pre-operatively by, and operated on, by DNR in an identical manner. The only consistent discernible difference between the two groups in their treatment was in the imaging offered to the patients in group B.

We are careful to emphasize to the patient that the images generated are simulations and not a guarantee of the surgical result, and a statement to this effect is printed on the image if a copy is distributed to the subject at their request. It is clearly the responsibility of the individual surgeon not to be unrealistic in their surgical aspirations, and to stay within the realms of their own technical expertise.

Kalter stated 'enhancement of the patient's ability to visualize proposed changes in facial features may allow improved, truly informed pre-operative consent'.⁹ This perceived improvement in doctor-patient communication does in our belief reduce the surgeon's vulnerability to litigation, as well as improve the ability of patient and surgeon to attain a pre-operative consensus on both a desired and achievable surgical result.

Acknowledgements

The authors would like to thank Mr N. C. Smeeton, Department of Public Health Sciences, Guys', Kings and St Thomas' School of Medicine for his advice and assistance in the statistical analysis of data during the preparation of this paper.

References

- 1 Vuyk HD, Stroomer J, Vinayak B. The role of computer imaging in facial plastic surgery consultation: a clinical study. *Clin Otolaryngol* 1998;**23**:235–43
- 2 Thomas JR, Freeman MS, Remmler DJ, Ehlert TK. Analysis of patient's response to preoperative computerised video imaging. *Arch Otolaryngol Head Neck Surg* 1989;**115**:793–6
- 3 Null RM. Computer imaging: the manufacturer's perspective. *Fac Plast Surg* 1990;**7**:26–30
- 4 Bronz G. Predictability of the computer imaging system in primary rhinoplasty. *Aesth Plast Surg* 1994;**18**:175–81
- 5 Robinson K, Gatheouse S, Browning GG. Measuring patient benefit from otorhinolaryngological surgery and therapy. *Ann Otol Rhinol Laryngol* 1996;**105**:415–22
- 6 Chait LA, Widgerow AD. In search of the ideal nose. *Plast Reconstr Surg* 2000;**105**:2561–7
- 7 Harris DL. Cosmetic surgery – where does it begin? *Br J Plast Surg* 1982;**35**:281
- 8 Harris DL. The benefits and hazards of cosmetic surgery. *Br J Hosp Med* 1989;**41**:540
- 9 Kalter PO, Baan B, Vuyk H. Medicolegal aspects of otolaryngologic, facial plastic, and reconstructive surgery. *Fac Plast Surg* 1995;**11**:105–11

Address for correspondence:
Mr D. N. Roberts F.R.C.S. (ORL-HNS)
Department of Otorhinolaryngology,
Guy's Hospital,
St Thomas' Street
London SE1 9RT, UK.

Mr H. R. Sharp takes responsibility for the integrity of the content of the paper.
Competing interests: None declared
