


Internet-based survey of the perceptions of surgical scars of Japanese patients

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Abstract

Introduction: The adverse aesthetic effects of post-surgical scars frequently impose a psychological burden on patients. We conducted an Internet-based questionnaire survey of Japanese individuals to explore patient satisfaction with respect to surgical scars and to identify the factors that affect their interest and experience of scar care.

Method: A cross-sectional study was conducted for the previous year on patients who had undergone the following surgeries: gastrointestinal; orthopaedic; obstetric; gynaecological; and plastic. The questionnaire included: (1) measures of participant characteristics; (2) measures of interest, experience and satisfaction with scar care; (3) measures of current and desired scar condition; and (4) measures of communication with physicians or nurses.

Results: A total of 214 participants were enrolled. Of these, only 90 individuals had experienced any treatment or self-care, and only 30 were satisfied with their experience. We found a significant gap between the current and desired thickness and colour of the scar ($P < 0.01$). On logistic regression analysis, scars located at a visible site and size of the scar were significant factors that affected the interest and experience of scar care. Only 40% of participants answered that their physician or nurse adequately understands their concerns pertaining to the scar condition.

Conclusion: Only a small proportion of individuals were satisfied with their experience of scar care. Additional research in following areas is required: (1) mutual communication between patients and medical providers; and (2) development of a new care programme for the management of scars.

Keywords

Incision wounds, quality of life, satisfaction, questionnaire, scar less, skin scar perception

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Lay summary

Scar formation at the site of surgery is a natural biological response. The cosmetic effects of scar have an adverse psychological impact on the patient owing to the visible difference between the normal skin and scar. In the present study, we explored scar satisfaction and identified the factors that affect the patient's interest and experience with respect to scar care. An Internet-based questionnaire survey of Japanese residents was conducted. The target population included patients who underwent gastrointestinal, orthopaedic, obstetrics and gynaecological, and plastic surgery. Out of 214 participants, 90 had experienced any treatment or self-care for scar care and only 30 were satisfied with their experience. There was a gap between the current and desired condition of thickness and colour in a scar. Scars located on visible parts of the body and size of scar had the greatest impact on the patient's interest and experience of scar care. Additional research is required in the following areas: (1) better communication between patients and medical providers; and (2) development of new care program for scar management.

Introduction

The number of patients undergoing surgery has progressively increased over time due in part to the rapid advances in medical and surgical technology.^{1–4} Development of a completely scar-less world is ideal; however, this objective is difficult to achieve with the current scientific technology.⁵ Development of scar at the site of surgical incision is inevitable. Scar formation at the site of dermal injury is attributable to biological wound healing mechanisms, which include haemostasis, inflammatory response, collagen reconstruction and re-epithelialisation. In addition to normal scar formation, this phenomenon may also produce problematic scars such as hypertrophic scars or keloids.^{6,7}

Generally, strategies for minimising the development of scarring are part of the operative plan in order to achieve better aesthetic outcomes at the site of surgery. For instance, the technique of Z-plasty is employed during incision to reduce the mechanical tension in the dermis and epidermis layers; the technique entails suturing the incision with subcutaneous or deep dermal sutures.^{8–10} In the postoperative period, silicone sheet or medical adhesive tape is often applied onto the scar surface in order to protect it from external stimuli.^{11,12} However, definitive clinical solutions for preventing or minimising scar development are yet to be established.

Scar formation at the site of surgical incision and its adverse aesthetic effects typically impose a psychological burden on the patients. Traditionally, scars are evaluated visually by the physician using subjective criteria. Recent reports have described the use of scar assessment tools including subjective evaluation questionnaire to assess the perceptions of patients with respect to scar formation after

orthopaedic, cardiac and thyroid surgery.^{13–17} Patient and Observer Scar Assessment Scale (POSAS) is a widely used scar assessment tool that assesses the perception of the patient and observer regarding the scar condition. The responses are scored using a subjective rating scale in the range of 1–10.^{18,19} However, the currently available scar assessment tools such as POSAS are at an experimental stage and do not provide an objective assessment of patient satisfaction with respect to the scar condition. In addition, the previous studies largely targeted a limited range of surgical procedures and were single-centre studies.^{13–17} Therefore, the extent of patient satisfaction with their scar condition after different types of surgeries is not well characterised. In addition, patient characteristics that may affect the patient's interest and experience of scar management are not well elucidated.

We conducted an Internet-based questionnaire survey targeting patients with post-surgical scar. The key objectives were: (1) to assess the current and the desired scar condition; and (2) to identify the patient factors that affect their interest and experience of scar management.

Methods

Study design

This was a cross-sectional study involving an Internet-based survey of a sample of individuals who had already registered for internet survey service of Kyowa Kikaku Co. Ltd. (Tokyo, Japan). The company is a research and analytical agency related to marketing of pharmaceuticals and medical devices in Japan. Individuals had voluntarily registered with the service with the understanding that various types of questionnaires may be distributed via the Internet. This study was

approved by the ethics committee of the Kitasato University Kitasato Institute Hospital (approval number: 18042). All aspects of this research were in accordance with the principles set out in the Declaration of Helsinki. The questionnaire survey was conducted from July to August 2018.

Sampling

The inclusion criteria for this study were as follows: (1) age > 20 years; (2) persons who had undergone gastrointestinal surgery, orthopaedic surgery, gynaecological surgery or plastic surgery; and (3) time elapsed since surgery (scar age) was < 1 year at the time of answering the questionnaire. Patients who had undergone surgery for treatment of burns were excluded from this study. Patients were also excluded if they did not provide informed consent to participate.

Sample size

A sample size of 50 patients for each surgical department was determined; thus, a total of > 200 patients were recruited for this study.

Procedure

The informed consent form, including the purpose, summary and time required to answer the question, was posted on the web before the start of the study. Clicking the button to participate was deemed to be consent. Only participants who agreed to participate were able to start answering the questionnaire. Participation in the present study was entirely voluntary and no incentives were offered to induce participation. A draft of the questionnaire was created by the authors. The questionnaire was finalised after receiving advice from the questionnaire preparation experts at our institution and the Kyowa Kikaku Co. Ltd. The estimated time required to complete the questionnaire was approximately 15 min.

The questionnaire included 17 measures which were divided into six parts. The outline of questions and the response options for each part in the questionnaire are shown in Table 1. The first part was a screening question that determined the participant's eligibility for participation in the survey. Based on the response, the subsequent parts of the questionnaire were displayed on the screen only for the eligible individuals. Only the second and later parts of this questionnaire are described in Table 1. Regarding the response options, the term 'single-answer multiple choice question' implies

that the participants can only click on one answer from among the circular buttons shown on the web screen. The term 'Dropdown question' implies that the participants were asked to select an appropriate response from a scrollable list on the display. The term 'rating scale' implies that the participants were required to select the most appropriate number from the range of numbers on display. For questions that required the use of a rating scale, the context for each answering option was also displayed, as shown in Table 1. Recruitment in the study was closed after confirmation of data collection from the target number of respondents for each surgical department; this was done to avoid excessive participation in the survey. Therefore, data collection was closed two weeks after the initial invitation for participation.

Data analysis

The continuous variables are expressed as mean and standard deviation, while the categorical variables are expressed as frequencies and percentages. The non-parametric Mann-Whitney U test was used for gap analysis between the current and the desired scar condition among participants. Missing values were excluded during data analysis.

In accordance with our previous report,²⁰ the odds ratios (ORs) for any relevant predictors were estimated by logistic regression analysis after first using a univariate model for each significant and marginal predictor derived from patient characteristics. Finally, logistic regression analysis was conducted using a multivariate model that included all variables that were either significant or marginal predictors in the univariate model. *P* values of 0.05 were considered indicative of statistical significance while a *P* value of 0.1 was considered indicative of a marginal trend toward significance.

In part 6 of the questionnaire, participants who answered 'strongly agree' or 'agree' were categorised as the 'agree' group, while the remaining participants were categorised as the 'not agree' group. All statistical analyses were conducted using Statistical Package for the Social Sciences version 20.0 software (IBM Corporation, Tokyo, Japan).

Results

Patient characteristics

Data pertaining to a total of 214 participants were collected in this study. The characteristics of participants are shown in Table 2. The majority of

Table 1. Questionnaire used in this study.

Part		Number of questions	Summary of questionnaire	Terms of questionnaire	Answering option
1	Screening questionnaire	2	(1) Have you undergone gastrointestinal, orthopaedic, obstetric and gynaecological, or plastic surgery within the last one year? 2) Was the surgery performed to treat burn?		Single-answer multiple choice question. 'Yes' or 'No'.
2	Characteristics of participant	7	(1) age, (2) sex, (3) time elapsed since surgery (scar age), (4) location of scar, (5) length of scar, (6) width of scar, (7) surgical department		Single-answer multiple choice question. Dropdown question.
3	Interest, experience and satisfaction with scar care	3	(1) In order to improve your scar condition, have you ever thought about receiving any therapeutic intervention or performing self-care?		Single-answer multiple choice question. 'Yes' or 'No'.
			(2) Have you actually experienced any scar care to improve the scar condition?		
			(3) Are you satisfied with the care you have experienced?		
4	Current scar condition	2	(1) How different is the thickness of current scar, compared with that of healthy part of skin. Please click an appropriate score based on your assessment.		Rating scales of 1–10, with a higher number denoting a worse score. 0 = equivalent to healthy part of skin. 10 = completely different to healthy part of skin.
			(2) How different is the colour of current scar, compared with that of healthy part of skin. Please click an appropriate score based on your assessment.		
5	Desired scar condition	2	(1) Assuming you receive any treatment or perform self-care, what is the desired thickness of scar, compared with healthy part of skin? Please click an appropriate score based on your assessment.		Rating scales of 1–10, with a higher number denoting a worse score. 0 = equivalent to healthy part of skin. 10 = completely different to healthy part of skin.
			(2) Assuming you receive any treatment or perform self-care, what is the desired colour of scar compared with healthy part of skin? Please click an appropriate score based on your assessment.		
6	Communication with physician or nurse	1	Do you think that your physician or nurse understands how much you are concerned about the development of scar?		Single-answer multiple choice question. 1 = Strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree.

Table 2. Characteristics of the study population.

Characteristics	Overall	Missing values
Age (years)	40.4 ± 10.3	0
Sex, female n (%)	132 (62)	0
Postoperative period of time (months)	6.8 ± 3.7	0
Location of scar		0
Head	5 (2.3)	
Face	13 (6.1)	
Neck	7 (3.3)	
Hand	31 (15)	
Arm	29 (14)	
Breast	11 (5)	
Torso	51 (24)	
Leg	31 (14)	
Back	9 (4)	
Others	27 (13)	
Length of scar (cm)		0
< 6	129 (60)	
≥ 6 and < 10	49 (23)	
≥ 11 and < 15	19 (9)	
> 16	17 (8)	
Width of scar (cm)		5
< 0.5	67 (31)	
≥ 0.5 and < 1	104 (49)	
> 1	42 (20)	
Type of surgery		0
Gastrointestinal surgery	56 (26)	
Orthopaedic surgery	56 (26)	
Gynaecological surgery	52 (25)	
Plastic surgery	50 (23)	

Values are given as n (%) or mean ± SD.
SD, standard deviation.

individuals were women (62%). The mean age of participants was 40.4 years (age range = 20–64 years). The mean scar age was 6.8 months (range

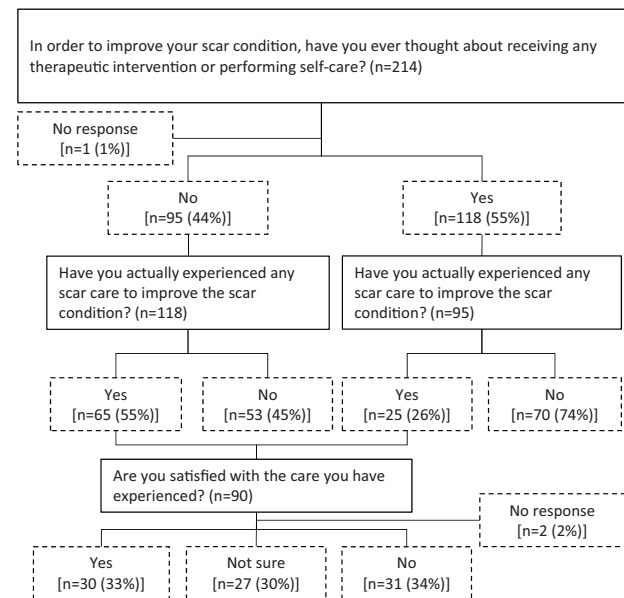


Figure 1. Participants' interest, experience and satisfaction with respect to therapeutic intervention or self-care of post-surgical scar.

= 1–12 months). The most frequent location of scars was torso (24%). In a majority of participants, the scar length was < 6 cm (60%) and the scar width was > 0.5 cm and < 1.0 cm (49%).

Interest, experience and satisfaction with scar care

Figure 1 shows the results pertaining to participant's interest, experience and satisfaction pertaining to the scar. A total of 118 (55%) individuals answered 'yes' to the question 'In order to improve your scar, have you ever thought to receive any therapeutic treatments or performed self-care?' Out of these 118 participants, 65 (55%) had actually received therapeutic intervention or performed self-care. Among the 95 participants who claimed lack of interest in any treatment or self-care, 25 (26%) had received therapeutic intervention or performed self-care. Among the 90 participants who have had experience of any treatment or self-care, only 30 were satisfied with their experience; this corresponded to 14% of the study population.

Current and desired scar condition

Using the numerical rating scale, the mean scores pertaining to the thickness and colour of scar were 4.4 ± 2.3 and 4.6 ± 2.6 , respectively. The scores were significantly higher than the scores

Table 3. Gap between the current and the desired scar condition.

	Current scar condition	Desired scar condition	P value
Thickness	4.4 ± 2.3	2.8 ± 1.9	< 0.001
Colour	4.6 ± 2.6	2.7 ± 1.9	< 0.001

Values are given as mean ± SD.
SD, standard deviation.

Table 4. Results of univariate analysis.

Variable	Participants who have interest in scar care			Participants who have experienced scar care		
	OR	95% CI	P value	OR	95% CI	P value
Age (year)	1.00	0.97–1.03	0.95	0.97	0.95–1.01	0.06*
Sex (female)	1.32	0.76–2.29	0.33	1.09	0.62–1.90	0.77
Scar at visible location	1.88	1.04–3.40	0.04 [†]	2.33	1.26–4.29	0.01 [†]
Length of scars (cm)						
> 11	2.84	1.26–6.37	0.01 [†]	0.72	0.34–1.51	0.38
Width of scars (cm)						
< 0.5	0.37	0.21–0.68	0.001 [†]	0.47	0.25–0.86	0.02 [†]
Type of surgery						
Gastrointestinal	0.82	0.45–1.51	0.53	0.70	0.37–1.32	0.27
Orthopaedic	0.82	0.45–1.51	0.53	1.23	0.66–2.27	0.51
Gynaecological	1.10	0.58–2.09	0.78	0.77	0.41–1.48	0.44
Plastic	1.40	0.74–2.64	0.31	1.48	0.79–2.77	0.22

*Significant at $P < 0.1$.

[†]Significant at $P < 0.05$.

CI, confidence interval; OR, odds ratio.

pertaining to the desired scar condition of assuming that they could receive any other treatment or perform self-care (Table 3).

Results of univariate analysis

On univariate analysis, participants with scars at visible parts of the body, those with scar length > 11 cm and those with scar width < 0.5 cm were significantly more likely to have an interest in scar care ($P < 0.05$). In addition, those with higher age, those with scars at visible location and those with scar width < 0.5 cm were significantly more likely to have had experience of scar care ($P < 0.05$) (Table 4). Based on these results, the variables included in the logistic regression

analysis were age, scar at visible location, scar length > 11 cm and width of scar.

Results of multiple logistic regression analysis

With respect to the interest in scar care, the odds ratio (OR) for scar at visible location of body was 2.19 (95% confidence interval [CI] = 1.14–4.19; $P = 0.02$). Other significant characteristics were scar length > 11 cm (OR = 3.39; 95% CI = 1.34–8.60; $P = 0.01$) and scar width < 0.5 cm (OR = 0.37; 95% CI = 0.19–0.73; $P = 0.004$) (Table 5).

With respect to the experience of scar care, the significant characteristics were age (OR = 0.97; 95% CI = 0.94–0.99; $P = 0.03$) and scar at

Table 5. Results of multiple logistic regression analysis.

Variables	Participants who have interest in scar care			Participants who have experienced scar care		
	OR	95% CI	P value	OR	95% CI	P value
Age	1.00	0.97–1.07	0.77	0.97	0.94–0.99	0.03*
Scar at visible location	2.19	1.14–4.19	0.02*	2.29	1.21–4.36	0.01*
Length of scar (cm)						
> 11	3.39	1.34–8.60	0.01*	1.04	0.45–2.38	0.93
Width of scar (cm)						
< 0.5	0.37	0.19–0.73	0.004*	0.59	0.29–1.17	0.13

*Significant at $P < 0.05$.

CI, confidence interval; OR, odds ratio.

visible part of the body (OR = 2.29; 95% CI = 1.21–4.36; $P = 0.01$) (Table 5).

Communication with physicians or nurses

A total of 85/213 (40%) participants were categorised as the ‘agree’ group (no response from one participant), while the remaining participants were categorised as the ‘not agree’ group in this part. To be categorised into the ‘agree’ groups meant that the participants chose the answering option ‘agree’ or ‘strongly agree’ to the question in part 6 of this questionnaire.

Discussion

Development of scar assessment tools and therapeutic measures are important in the context of prevention and treatment of scars, hypertrophic scars and keloids. However, development of patient-reported outcome measures is also a key imperative for these patients. Several previous studies involving scar assessment tools and therapeutic measures have helped inform clinical guidelines for scar prevention and treatment.^{21–23} However, patient-reported outcome measures in the context of scar management have not been adequately addressed in the contemporary literature. POSAS is a subjective tool for self-evaluation of scar condition and satisfaction; however, it is currently difficult to verify whether patients are really satisfied with their scar condition or not.

Despite answering ‘No’ to the question ‘In order to improve your scar condition, have you

ever thought of receiving any therapeutic intervention or performing self-care?’, 25 participants answered ‘Yes’ to the question ‘Actually, have you experienced any scar care to improve the scar condition?’ This may be attributable to proactive patient education and recommendation about treatment by physicians or nurses.

The most important finding of this study was that only 30/214 (14%) participants were satisfied with any scar care that they had received (Figure 1). Consistent with this result, our study also showed a significant gap between the current condition and the desired condition of scar thickness and colour. This finding indicates that it is important for both patients and healthcare providers to receive education of knowledge of latest scar management practices. In relation to this, it should be noted that the Japan Scar Workshop scar scale was established in 2011 and updated in 2015.²⁴ The authors believe that use of such tools for education may help promote expansion of knowledge and clinical practice.

Results of logistic regression analysis suggested that scar visibility is very important to the participants. This result is consistent with a previous study of patients who had undergone thyroidectomy.¹⁴ On the contrary, a previous study found that non-visible scar generates greater psychosocial stress.²⁵ Thus, further studies are required to assess whether scar visibility has a significant effect on patients’ interest, experience and satisfaction with respect to scar care.

Size of scar (both length and width) was also significantly associated with participants’ interest in scar care, although no significant difference was observed with respect to the experience of

scar care. In a study by Chaung et al.,²⁶ longer and/or thicker scars after thyroid surgery were perceived as worse than shorter and/or thinner scars. Reduction of mechanical stress and tension around the surgical scar plays an important role in reducing the scar width. To achieve this, the authors recommend the continuous use of adhesive tape and polymer-based dressing (e.g. silicone gel sheet) in the postoperative period, as a self-care measure.

Of the respondents, 85 (40%) answered that their physician or nurse would adequately understand their worries pertaining to the scar condition. It is not clear whether this percentage is high or not; however, the authors suggest that physicians and nurses should spend more time in the preoperative period to confirm patient-specific expectations with respect to scar care. Initiation of patient education and mutual communication between patients and care providers in the preoperative period can help achieve more effective scar care and ensure continuity of treatment from the postoperative period to the completion of wound healing.²⁷

In realistic situations, it is clear that patients with normal or problematic scars frequently experienced psychological distress (anxiety and depression) and chronic symptom (scar tissue pain and itching). Minimising changes of appearance in scarring as well as enhancing patient satisfaction can contribute to improving the quality of life in patients' daily lives. As the majority of surgical patients have concerns about changes in body image after surgery, it is important to conduct appropriate support about scar management between patients and clinicians both before and after surgery, with mutual communication.

There are several known advantages and disadvantages of Internet-based questionnaire surveys. Online surveys offer the advantage of convenient access to populations and time and cost savings; however, these are vulnerable to sampling bias.²⁸ For example, in this study, further recruitment was stopped once the target number of respondents was achieved. Participants who agree early on the survey are likely to be strongly interested in the research question. In addition, we did not collect detailed demographic data of each participant (other than age and sex); therefore, our results may not be entirely generalisable.

We did not perform a power calculation to estimate the appropriate sample size because the number of an accurately estimated population could not be set before the start of this study. Our analysis might be underpowered because the number of patients undergoing surgery in the

department we were targeting has progressively increased; however, the authors believe that a sample size of > 200 participants should be sufficient to achieve the objectives of this questionnaire survey. A further prospective study involving a large sample size will be required to assess the patients' perceptions about scars.

As a next step, a secondary analysis of data obtained in this study will be undertaken to clarify the interests, experiences and satisfaction with respect to scar care in each surgical department or in different patient groups. This is because the requirements of patients with respect to prevention and treatment of scars may differ based on the type of surgery. In future, we intend to conduct a prospective clinical study to contribute to the development of care programs and technologies for improvement of patient-centred outcomes of scar management.

Conclusion

An Internet-based questionnaire survey was conducted to assess the interest, experience and satisfaction with respect to scar management in patients who had undergone gastrointestinal, orthopaedic, obstetric and gynaecological, and plastic surgery. A relatively large percentage of respondents were not satisfied with their experience of scar care. Scar located at a visible part of the body and size of scar showed a significant impact on the interest and experience in treatment or self-care for scar care. The authors suggest that patient education, mutual communication between patients and medical providers, and development of new preventive and therapeutic programme for the management of scars will be required for future study.

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