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## Fleur-de-Lys abdominoplasty—a consecutive case series<sup>☆</sup>

C.G. Duff\*, S. Aslam, R.W. Griffiths

Department of Plastic, Burn and Reconstructive Surgery, Northern General Hospital, Herries Road, Sheffield S5 7AU, UK

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### KEYWORDS

Fleur-de-Lys abdominoplasty; Body mass index; Thromboembolic disease stockings; Bariatric surgery

**Summary** Sixty-eight consecutive patients who had undergone Fleur-de-Lys abdominoplasty are described. The mean age was 39 years, (22-62 years) and the mean body mass index (BMI) was 29 kg/m<sup>2</sup> (17-47 kg/m<sup>2</sup>). Forty patients had documented weight loss, mean 39 kg (10-103 kg). The operation duration ranged from 1 h 10 min to 4 h 15 min. The mean mass of tissue resected was 2.4 kg, (0.3-9.1 kg). The overall complication rate was 42/68 (62%) and complications were categorised as early, late, general and aesthetic. Complications were significantly related to patients with a greater age ( $p = 0.0091$ ), increasing BMI ( $p = 0.0039$ ), greater weight ( $p = 0.0014$ ) and greater mass of tissue resected ( $p = 0.0002$ ). There was no significant association between smoking and complications. There was no significant association between previous gastric partitioning surgery and complications. Despite the significant complication rate, a single operation achieved a satisfactory outcome in 82% of patients. Our data reinforce findings from previous studies, which have demonstrated that patients should be required to reduce weight prior to body contouring surgery. © 2003 The British Association of Plastic Surgeons. Published by Elsevier Ltd. All rights reserved.

Body contouring surgery has been used to improve the appearance and functional problems of the excess abdominal-wall tissue following significant weight loss. Traditional abdominoplasty allows the surgeon to address the excess of skin and fat in only one plane, where the abdominal-wall tissue hangs from the waist, although post-operative lateral fullness can be a common problem. However, in many patients there has been such significant weight loss that there is excess tissue in the midline

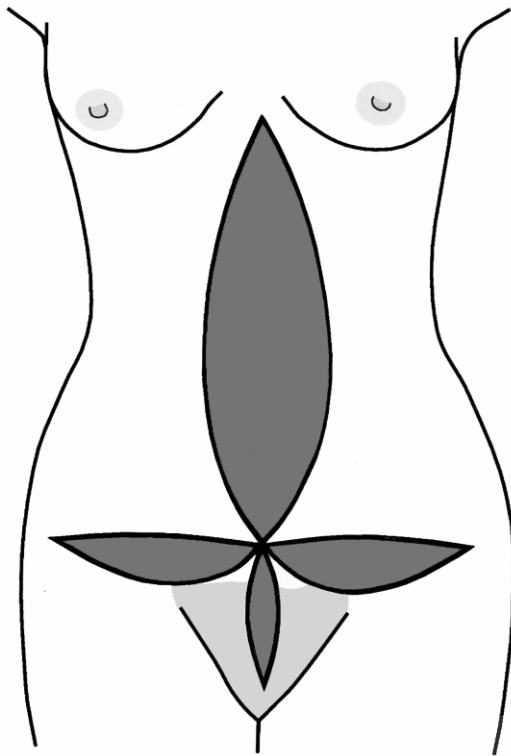
and laterally as well. The vertical midline component of the Fleur-de-Lys abdominoplasty addresses these excess tissues in the vertical plane as well as the pendulous abdominal panniculus.

It has been recognised for almost a century that there is a need for a vertical component to the abdominoplasty resection in some patients. In his treatise on the operative treatment of abdominal obesity Foged cited many authors who have sought to achieve correction of the vertical component of the abnormality.<sup>1,2</sup> The term Fleur-de-Lys abdominoplasty was popularised by Dellon in 1985,<sup>3</sup> although a similar procedure had been described prior to this by Castanares and Goethel in 1967.<sup>4</sup>

<sup>☆</sup> This work was presented to the Summer Meeting of the British Association of Plastic Surgeons, July 2001, Stirling University.

\*Corresponding author. Fax: +44-114-261-9651.

E-mail address: duffcg@aol.com



**Fig. 1** Diagram of key stitch placement giving the Fleur-de-Lys pattern.

The operation takes its name from the pattern generated when the first key stitch is placed to bring the skin flaps together following the resection. (Fig. 1)

Fleur-de-Lys abdominoplasty has been used for selected patients in the senior author's practice for 15 years and this study seeks to identify patient characteristics, operation details, complications and give advice for the management of this challenging group of patients.



**Fig. 2** Assessment of excess skin and fat in the vertical plane.

## Method

The cases were identified from the senior author's log book. This list was then cross-referenced with the hospital record for the same period. The case notes of this consecutive series of patients were reviewed retrospectively and the data were collected and stored using Microsoft Access. The statistical analysis was performed using Mann-Whitney *U* test, Chi-squared test and the Spearman rank correlation coefficient. Statistical significance was taken at the level of  $p < 0.05$ . The data collected included the patient's demographics and their height and weight. For patients who achieved preoperative weight loss, the reason for their weight loss was recorded. The operative details, operation duration and mass of tissue resected at operation, were noted. Post-operative complications were categorised as early, late, general and aesthetic complications. The date of discharge from the outpatient dressing clinic was also recorded. The data derived from these results included the body mass index (BMI), the length of inpatient stay and the length of time to discharge from the dressing clinic. This latter figure was taken as a proxy for the time to wound healing.

All patients who had undergone Fleur-de-Lys abdominoplasty were invited back to the hospital for a clinical review.

## Operative technique

The presence of excess skin in the midline can be assessed by grasping this skin in the supine patient, and drawing upwards, in a similar fashion to the assessment of the abdominal panniculus. (Fig. 2).

The surgical technique used was that described by Dellon.<sup>3</sup> The incision extending into the mons pubis was used at the surgeon's discretion. Emphasis was placed on minimal undermining of the abdominal skin. Rectus plication with nonabsorbable sutures was also performed, as well as repair of coexisting hernia if required. Liposuction was not performed in any patients.

To minimise the incidence of thrombo-embolic complications, all patients were given either subcutaneous heparin 5000 IU b.d., or (in the later years of this study) Clexane 20 mg on the evening prior to surgery. Intraoperatively intermittent compression was applied to the calves and thrombo-embolic disease stockings (TEDS) were used during the peri-operative period until the patients were discharged from hospital.

**Table 1** Complications

	Type of complication	n
Early	Wound infection/dehiscence	9
	Haematoma (surgically drained)	3
	Blood loss requiring transfusion	2
Late	Delayed wound healing	17
	Seroma (drained)	4
	Hypertrophic scarring	2
General	Chest infection	3
	Abdominal distension	1
Aesthetic	Epigastric fullness revised	4
	Scar revision required in all areas	4
	Lateral dog ears revised	3
	Lower midline scar revised	1

## Results

One hundred and seventeen abdominoplasties were undertaken under the care of one consultant between the years 1986 and 2000. The 68 (58%) Fleur-de-Lys pattern reductions are studied here; this includes one patient who underwent Fleur-de-Lys revision of a traditional abdominoplasty. Sixty-four patients were female (M:F 1:16), and the mean age was 38.7 years (22–62 years). The mean BMI at the time of operation was 29.3 kg/m<sup>2</sup> (17–47 kg/m<sup>2</sup>).

Forty patients had documented weight loss prior to abdominoplasty, mean weight loss 39 kg (10–103 kg). Eighteen patients had achieved weight loss following gastric partitioning, whilst dieting accounted for weight loss in 14 patients. Eight patients achieved weight loss following correction of endocrine abnormalities or following pregnancy.

Twenty-eight patients had excessive laxity of the abdominal wall following pregnancy.

Operation duration had a mean of 2 h 10 min (1 h 10 min to 4 h 15 min). The amount of tissue excised correlated well with the duration of the operation

**Table 2** Characteristics of those suffering complications against those who did not

	No compl.	Compl.	p
Mean age (years)	35.6	40.6	0.0091
Mean BMI (kg/m <sup>2</sup> )	26.5	31.0	0.0039
Mean weight (kg)	69	82	0.0014
Mean mass resected (g)	1352	3033	0.0002
Smokers (n)	8	13	0.9873
Nonsmokers (n)	18	29	
Gastroplasty (n)	4	14	0.1030
No gastroplasty (n)	22	28	

(Spearman rank correlation coefficient  $r = 0.55$ ,  $p < 0.002$ ).

The mean post-operative length of hospital stay was 7.7 days (median 4 days, range 2–63 days). Five patients had a hospital stay >20 days due to either wound infection or dehiscence or following chest infection.

The mean time to discharge from dressing clinic was 28 days (median 16 days, range 3–127 days). Five patients required dressing care for >80 days, two of whom had had a prolonged hospital stay.

Complications were designated early (<2 weeks), late (>2 weeks), general or aesthetic (Table 1). One patient with a BMI of 38 kg/m<sup>2</sup> required ventilation in the intensive care unit in the immediate post-operative period due to a chest infection. Forty-two patients exhibited one or more complications, giving 53 complications in total. Delayed wound healing was the most common complication occurring in 17 patients. There were, however, no thrombo-embolic complications, either during inpatient or outpatient care. The patients who experienced complications were significantly older ( $p = 0.0091$ ), had a greater weight ( $p = 0.0014$ ), had a greater BMI ( $p = 0.0039$ ) and had a greater amount of tissue removed ( $p = 0.0002$ ). Neither smoking nor previous gastric partitioning surgery were significantly associated with complications ( $p = 0.103$  and  $p = 0.987$ ) (Table 2). There was no correlation between BMI and time to wound healing.

Twelve patients (17.6%) underwent subsequent revision surgery, four for epigastric fullness, three for lateral dog-ears and four for scar revision where scars had become stretched or infection had complicated wound healing, and one for correction of the lower component of the midline scar. In one patient, revision of the epigastric scar resulted in unsatisfactory scarring which extended above the xiphisternum. Therefore, in this retrospective study 56/68 (82.4%) of patients achieved a satisfactory result after a single procedure. Representative cases are shown in Fig. 3(a)–(d) and results are shown graphically in Fig. 4(a)–(d).

All patients were invited to a review clinic but only 13/68 (19%) responded and could not be considered representative of the whole cohort. Further analysis of this subgroup was not attempted.

## Discussion

Whilst abdominoplasty is a commonly performed procedure, the single transverse lower abdominal



A



**Fig. 3** (A) Case 1 before and 2 months after Fleur-de-Lys abdominoplasty in which 2.6 kg of tissue were resected. The preoperative BMI was 27 kg/m<sup>2</sup> and weight loss followed dietary measures. (B) Case 2 before and 3 years after Fleur-de-Lys abdominoplasty in which 1.4 kg of tissue were resected. The preoperative BMI was 26 kg/m<sup>2</sup> and weight loss followed pregnancy. (C) Case 3 before and 2 years after Fleur-de-Lys abdominoplasty in which 2.8 kg of tissue was resected. The preoperative BMI was 30 kg/m<sup>2</sup> and weight loss followed correction of hypothyroidism. (D) Case 4 before and 2 years after Fleur-de-Lys abdominoplasty in which 0.8 kg of tissue was resected. The preoperative BMI was 24 kg/m<sup>2</sup> and weight loss followed pregnancy.

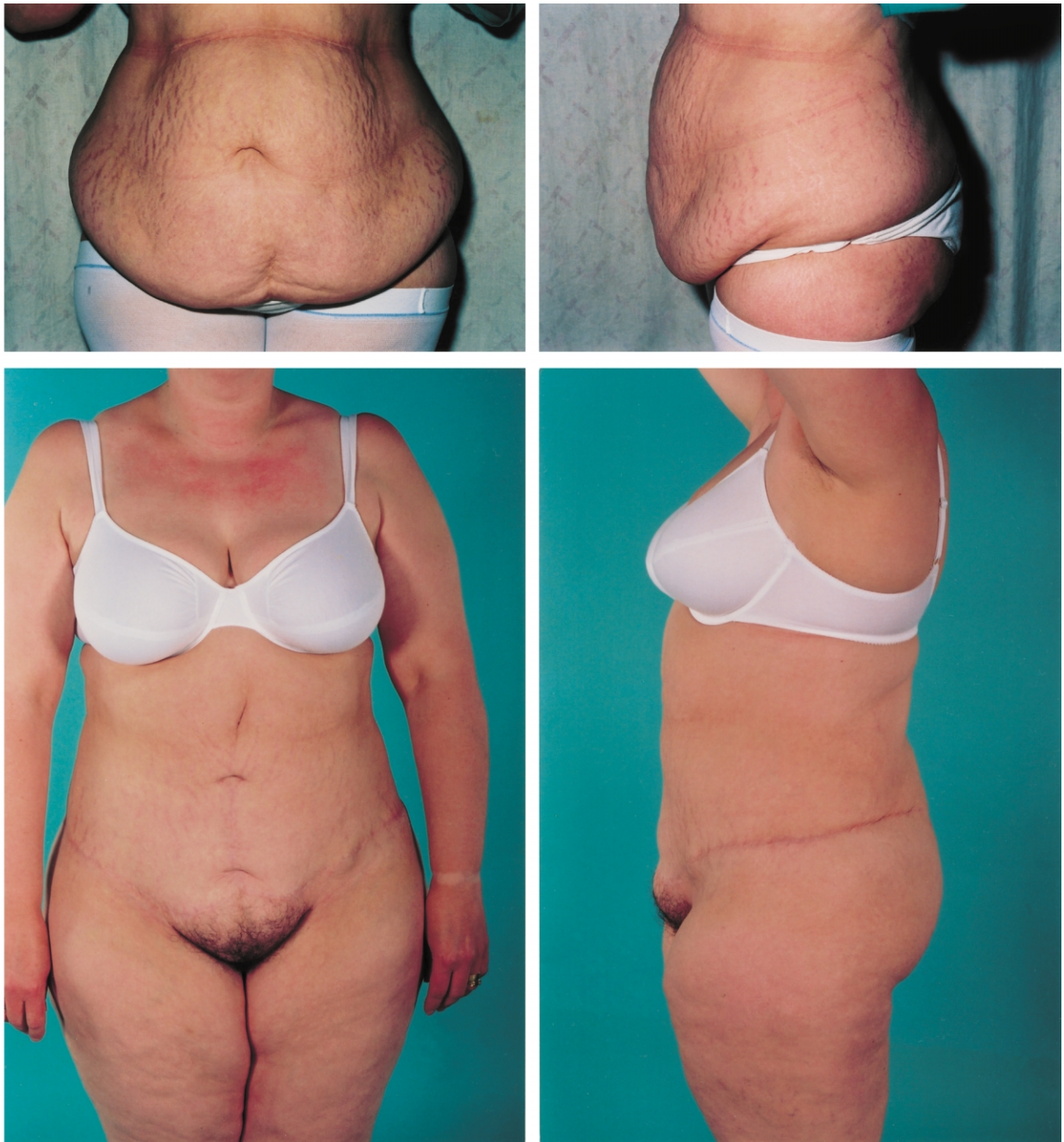


Fig. 3 (continued)

incision<sup>5-12</sup> is not ideal for addressing the gross tissue excess and laxity that is present in many patients, particularly after significant weight loss. Central abdominal wall and lateral flank laxity are not always adequately corrected by the lower transverse approach alone. Although some authors have described adjuvant liposuction with the lower incision,<sup>13-17</sup> liposuction was not used in the present series.

In the present series, the indications for Fleur-de-Lys abdominoplasty surgery outlined by Dellon<sup>3</sup>

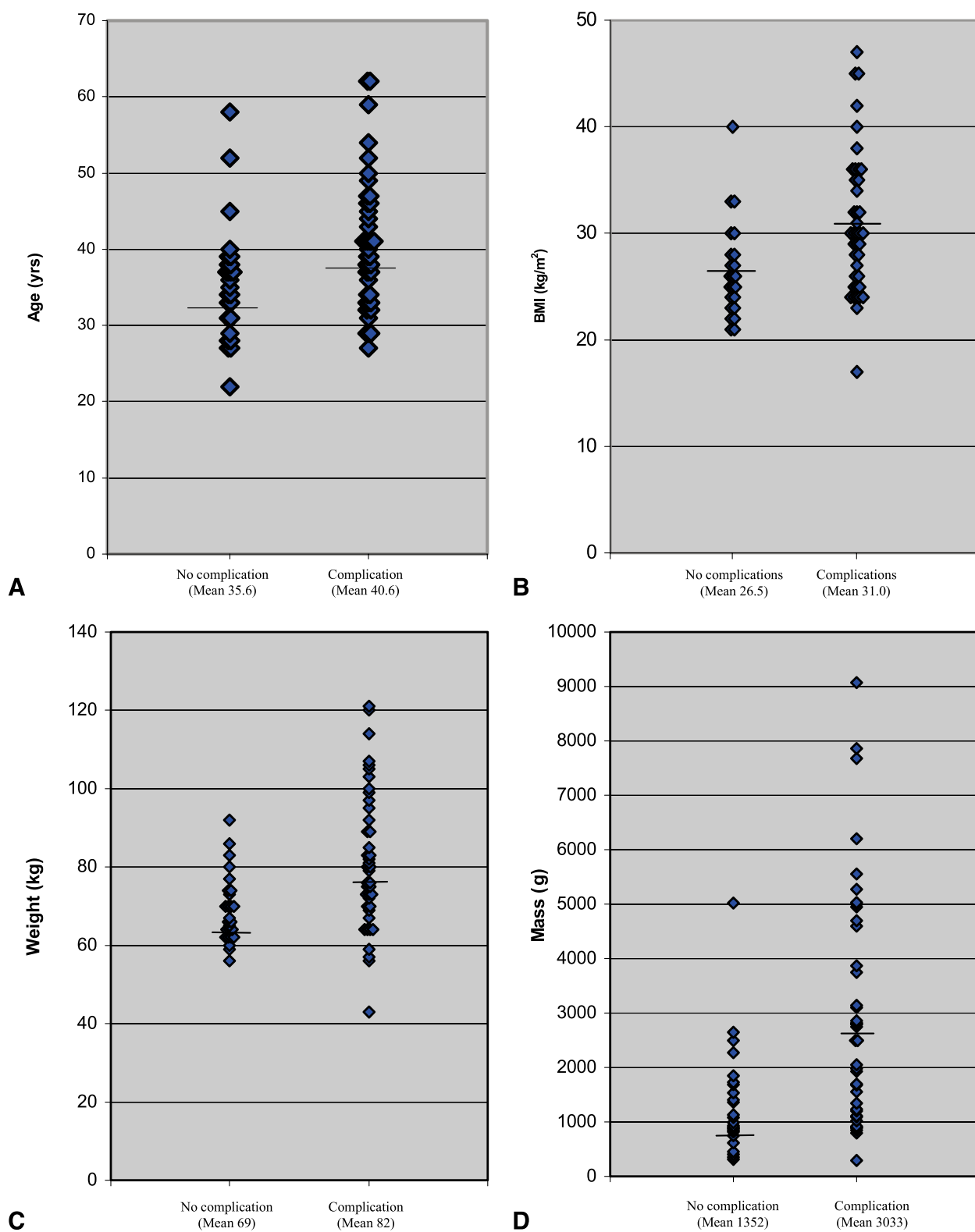
were used including patients who had achieved marked weight loss, those with an abdominal panniculus associated with generalised obesity, and patients with supra-umbilical dermatochalasis with or without multiple abdominal scars. We also considered that the technique could be extended to patients with marked midline tissue excess, regardless of the BMI.

The complications consequent upon abdominoplasty in general have been described by several authors.<sup>14,15,18-25</sup> These authors describe



D





**Fig. 4** (A) Graph to show a comparison of age in those with and without complications. (B) Graph to show a comparison of BMI in those with and without complications. (C) Graph to show a comparison of weight in those with and without complications. (D) Graph to show a comparison of mass of tissue resected in those with and without complications.

complication rates between 8.3 and 43.7%, and satisfaction rates of 86–100% are given in three studies.<sup>15,18,19</sup> However, only one of these studies addresses the results specifically of the Fleur-de-Lys method<sup>25</sup> and there are few series describing the Fleur-de-Lys technique. In Dellon's series of 16 patients complications were divided into major and minor, two patients had major and six patients had minor complications, an overall complication rate of 50%.<sup>3</sup> A further 15 patients were described from Hull, UK,<sup>24</sup> mean age 42 years, mean BMI 28 kg/m<sup>2</sup> and the mean mass of tissue resected 2277 gm. Six patients (40%) exhibited complications. Finally, Ramsey-Stewart<sup>25</sup> described 45 Fleur-de-Lys abdominoplasties. An average of 2.6 kg (range 2.2–4.8 kg) of tissue was removed. The patients were required to have maintained a stable weight for at least 2–3 months prior to surgery and the surgery was performed at a mean of 20 months after bariatric surgery. Six complications were described including urinary tract infection, seroma and partial wound breakdown.

Our most important findings are that the Fleur-de-Lys abdominoplasty effectively contours the abdomen in the majority of our patients, and that complications were significantly associated with greater patient age, weight, BMI and mass of tissue resected. However, unlike some other studies we did not find an association between complications and cigarette smoking.<sup>15,21</sup>

The present study represents the largest series of Fleur-de-Lys abdominoplasties published to date and has specifically emphasised the difficulties and limitations of this technique. The aggressive policy on thromboprophylaxis was associated with no clinically evident thrombo-embolic episodes. We found that the total complication rate in our series was as high as that found in other series. However, few of the complications were considered to have a significant impact on the final surgical result, and the majority of complications were managed in the outpatient setting. Five patients required inpatient stays of longer than 20 days and five patients required care in the dressing clinic for longer than 80 days due to delayed wound healing. Only 12 patients (17.6%) required revision surgery due to aesthetically unsatisfactory results. Four of these were for epigastric fullness, which can be considered to be a midline dog-ear as a consequence of the minimal undermining of the abdominal skin in this area during the primary surgery. One patient remained dissatisfied despite revisional surgery to this area.

Clearly a high body mass and BMI will be associated with a greater risk of complications. In the setting of the other common mass reducing

procedure, breast reduction, Budny et al.<sup>26</sup> have presented data indicating that all patients with a weight >85 kg suffered a complication and that complications were more common with a BMI > 28 kg/m<sup>2</sup>.

Patients can reasonably be counselled that the procedure is valuable, but that the scarring is significant and increasing weight and BMI are associated with an increasing risk of complications, especially delayed wound healing. If the patient's requirement is for an abdominal wall as tight and flat as possible, and to feel comfortable in clothes, then the Fleur-de-Lys abdominoplasty should be offered as an alternative to the lower transverse approach, and all advantages, disadvantages and relative risks compared.

## Acknowledgements

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