Reconstructive surgery after female genital mutilation: a prospective cohort study

Pierre Foldès, Béatrice Cuzin, Armelle Andro

Summary

Background Women who have undergone female genital mutilation rarely have access to the reconstructive surgery that is now available. Our objective was to assess the immediate and long-term outcomes of this surgery.

Methods Between 1998 and 2009, we included consecutive patients with female genital mutilation aged 18 years or older who had consulted a urologist at Poissy-St Germain Hospital, France. We used the WHO classification to prospectively include patients with type II or type III mutilation. The skin covering the stump was resected to reveal the clitoris. The suspensory ligament was then sectioned to mobilise the stump, the scar tissue was removed from the exposed portion and the glans was brought into a normal position. All patients answered a questionnaire at entry about their characteristics, expectations, and preoperative clitoris pleasure and pain, measured on a 5-point scale. Those patients who returned at 1 year for follow-up were questioned about clitoris pain and functionality. We compared data from the 1-year group with the total group of patients who had surgery.

Findings We operated on 2938 women with a mean age of 29·2 (SD 7·77 years; age at excision 6·1, SD 3·5 years). Mali, Senegal, and Ivory Coast were the main countries of origin, but 564 patients had undergone female genital mutilation in France. The 1-year follow-up visit was attended by 866 patients (29%). Expectations before surgery were identity recovery for 2933 patients (99%), improved sex life for 2378 patients (81%), and pain reduction for 847 patients (29%). At 1-year follow-up, 363 women (42%) had a hoodless glans, 239 (28%) had a normal clitoris, 210 (24%) had a visible projection, 51 (6%) had a palpable projection, and three (0·4%) had no change. Most patients reported an improvement, or at least no worsening, in pain (821 of 840 patients) and clitoral pleasure (815 of 834 patients). At 1 year, 430 (51%) of 841 women experienced orgasms. Immediate complications after surgery (haematoma, suture failure, moderate fever) were noted in 155 (5%) of the 2938 patients, and 108 (4%) were briefly re-admitted to hospital.

Interpretation Reconstructive surgery after female genital mutilation seems to be associated with reduced pain and restored pleasure. It needs to be made more readily available in developed countries by training surgeons.

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Introduction

Most international health organisations would like to see an end to female genital mutilation.[1,2] Between 130 and 140 million women worldwide have undergone female genital mutilation in the past 10 years, including 92 million girls in Africa. Every year, an estimated 3 million girls are at risk of undergoing the procedure.[3] Female genital mutilation is widespread in Africa, but also occurs in immigrant communities in Europe and North America. It has medical, psychological, and psychosexual consequences, which have been described in detail.[4–7] Nor should one forget the unacceptably high number of young girls who die as a result of life-threatening infections such as tetanus or haemorrhage; in areas of Sudan where antibiotics are not available, a third of the girls undergoing female genital mutilation are estimated to die from infection.[8–10] Efforts to end this procedure started decades ago, but require major social changes. Repairing the mutilation is an interim solution.[11]

Women with female genital mutilation rarely have access to reconstructive surgery to improve their lives. According to the WHO classification, type III mutilation corresponds to the "narrowing of the vaginal orifice with creation of a covering seal by cutting and appositioning the labia minora and/or the labia majora, with or without excision of the clitoris (infibulation)".[12] The WHO goes on to state that women who have undergone type III mutilation require defibulation before delivery. Functional improvements have been described after this defibulation procedure, mainly in Somalian populations.[13–15] The surgical techniques described in the present Article were initially developed in the context of humanitarian medicine in Burkina Faso. In France, reconstructive surgery has been available on the French national health service since 2004. Surgery was initially offered to women with pain sequelae, but has since been extended to women wishing to improve their sex lives or their physical appearance. In an earlier study,[15] which ran from 1992 to 2005, we were able to restore a visible clitoral mass in 394 (87%) of 453 patients, and 75% of women reported a genuine short-term improvement in clitoral function.[16] Most patients had undergone type II mutilation, that is, partial or total removal of the clitoris glans and the labia minora, with or without excision of the labia majora (excision).

However, patient satisfaction and outcomes were not measured over the long term. Here, we aim to assess both the immediate and long-term outcomes of reconstructive surgery for female genital mutilation to help women to improve their sex lives, recover their identity, and reduce pain. These were the objectives expressed by the women themselves, as described in our earlier publication[16] and subsequently corroborated in a survey.[17]

Methods

Patients

Between 1998 and 2009, we prospectively included consecutive patients with female genital mutilation aged 18 years or older who had consulted a urological surgeon (PF) at St Germain Poissy Hospital, St Germain en Laye, France. Our study complied with all the French ethics requirements that were then in force, and was done according to French research guidelines. Approval from the Institutional Review Board (IRB) was not necessary since this study was done before it became mandatory in France in Feb 21, 2012. Patients were informed orally and in a written form about efficiency and side-effects of surgical procedure. Our surgical ward receives patients with female genital mutilation who want to have their mutilation repaired. Most of the patients present themselves, but a few are referred. Our work was never publicised, and this study was done in a pragmatic setting, with no particular changes to our usual practices.

See Online for appendix

We used the WHO classification[18] to prospectively include women with either type II or type III mutilation (infibulation) with excision. We excluded patients with type III mutilation who had not undergone excision of the clitoris.

Procedures

All patients filled out a questionnaire at entry about their characteristics (age, country of origin, country of excision) and their preoperative clitoral pain and clitoral pleasure. We assessed the patients' expectations for pain and clitoral pleasure on 5-point scales (appendix). These scales pragmatically described the patients' sensations and had already been used elsewhere[16] but were not validated. For clitoral pleasure, for instance, patients could choose between: never (no sensation), minor sensation, pleasant without orgasm, restricted orgasm (orgasm with less intensity than wished), and regular orgasm ("normal" orgasm).

The surgeon (PF) did a standardised surgical procedure on all the patients.[18] The key surgical principle was to restore both clitoral anatomy and clitoral function[19] (figure; a full description of surgical procedure is available in the appendix). Under appropriate general anaesthesia via laryngeal mask; we first created a circular "buttonhole" skin incision over the clitoral shaft stump. The skin covering the distal stump of the clitoris was resected sharply with scissors. The suspensory ligament was gradually transected close to the bone and as deeply as needed to allow sufficient downward mobilisation of the clitoris to bring it to the glans' anatomical position. The dorsal region neurovascular bundle was preserved. A first layer of suture was used to hold the extremity of the neoclitoral shaft in place to prevent retraction. Running or interrupted monocryl sutures were carefully placed inferiorly, passing from the residual fibrous layer surrounding the tunica to the vestibular mucosa and skin. Above the clitoris, the vestibular skin was closed with interrupted polyglactin stitches passing through the subcutaneous connective tissue on both sides and the periosteum in the middle. All the dissected spaces were infiltrated with local anaesthetic (6 mL of ropivacaine 7·5 mg/mL). If necessary, the preliminary procedures done to uncover the clitoral stump consisted of defibulation and removal of pseudocysts.

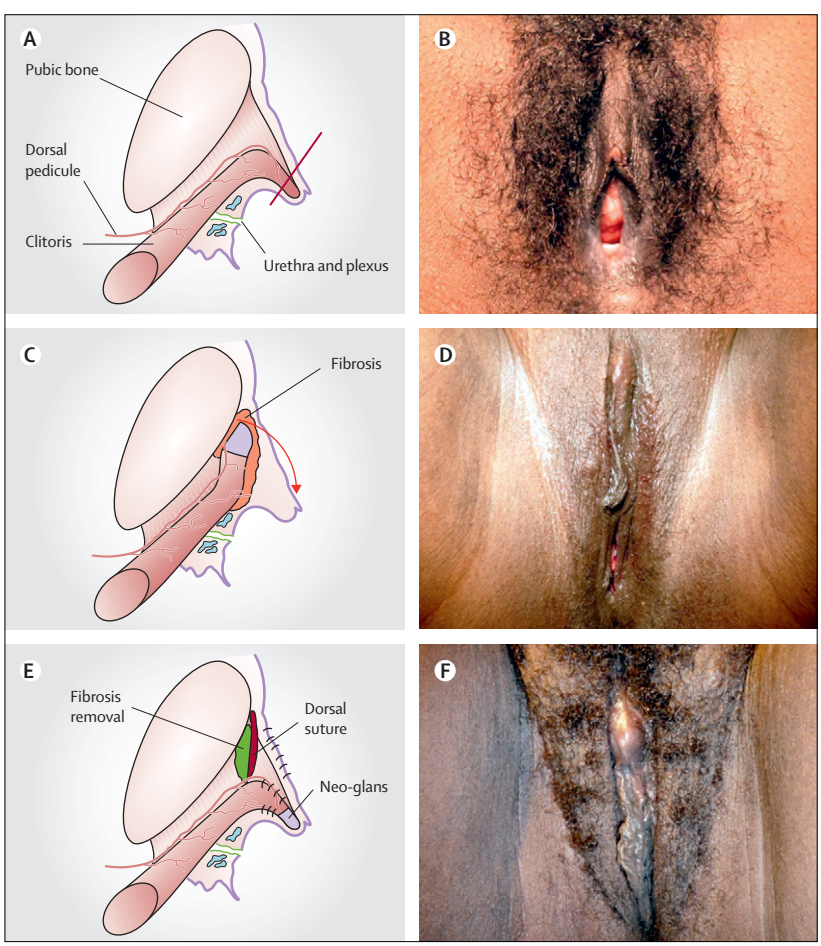

Figure: **Excision, scarring, and reconstruction of female genital mutilation**
(A) Scheme representing the anatomy of a non-mutilated clitoris. Effect of further cutting of clitoral glans is represented by a red line. (B) Example of a non-mutilated clitoris. (C) Fixed clitoris after scarring: the surgery consists of freeing the clitoris from the bone adherence that immobilises it and thwarts its dynamic physiology. (D) Example of type 2 mutilation with pseudoinfibulation. (E) Scheme representing the outcome after reconstructive surgery. (F) Example of aesthetic outcome at 1 year after reconstructive surgery, with an apparent functional clitoris, and aesthetic labia minora.

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Patients were discharged within 2 days of surgery. About two weeks after surgery, they were examined and asked to come back in a year's time. We informed them that postoperative pain would last for about 2 weeks and that the wound would take 2 months to heal (epithelialisation), at which point they would be able to resume sexual intercourse. At the 1-year visit, women were questioned about pain and functionality. We compared the 1-year group with the total group at inclusion to check for representativeness.

Statistical analysis

We prospectively entered the data in Stata 10, and did post-hoc analyses. We worked on the assumption that missing data were not a reason for exclusion, and analysed all the variables in a pragmatic way, according to available data. We provide the numerator for each variable. We used the χ^2 test to compare characteristics at inclusion. We took the year of attendance into account for all the preoperative criteria (Pearson test). We analysed the odd ratios and 95% CIs, and used logistic regression for the prognosis variables. Logistic was used for statistical analyses.

Role of the funding source

The sponsor of the study supported the data analysis and the English editing of the report, but had no role in the study design, data collection, data analysis, the writing of the report, or the decision to submit for publication. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

	Clitoral pleasure before surgical procedure						Pain before surgical procedure					
	Never	Minor sensation	Pleasant without orgasm	Mutilation-restricted orgasm	Regular orgasm	Total	No pain	Minor discomfort during intercourse	Moderate pain during intercourse	Strong to unbearable pain during intercourse	Pain without intercourse	Total
Year of consultation*												
1998–2003	46/143 (32%)	32/143 (22%)	47/143 (33%)	16/143 (11%)	2/143 (1%)	143	83/173 (48%)	41/173 (24%)	22/173 (13%)	16/173 (9%)	11/173 (6%)	173
2004	149/390 (38%)	67/390 (17%)	98/390 (33%)	50/390 (11%)	26/390 (7%)	390	202/392 (52%)	77/392 (20%)	71/392 (18%)	30/392 (8%)	12/392 (3%)	392
2005	235/534 (44%)	58/390 (11%)	105/390 (20%)	85/390 (16%)	52/390 (10%)	534	355/552 (64%)	45/552 (8%)	84/552 (15%)	44/552 (8%)	24/552 (4%)	552
2006	271/459 (59%)	27/459 (6%)	79/459 (17%)	42/459 (9%)	40/459 (9%)	459	327/464 (70%)	27/464 (6%)	59/464 (13%)	39/464 (8%)	12/464 (3%)	464
2007	253/454 (56%)	14/454 (3%)	99/454 (22%)	26/454 (8%)	62/454 (14%)	454	336/455 (74%)	16/455 (4%)	59/455 (13%)	34/455 (7%)	10/455 (2%)	455
2008	218/397 (55%)	7/397 (2%)	85/397 (21%)	33/397 (8%)	54/397 (14%)	397	297/398 (75%)	4/398 (1%)	59/398 (15%)	23/398 (6%)	15/398 (4%)	398
2009	131/235 (56%)	3/235 (1%)	29/235 (12%)	31/235 (13%)	41/235 (17%)	235	198/261 (76%)	4/261 (2%)	36/261 (14%)	11/261 (4%)	12/261 (5%)	261
Total	1303/2613 (50%)	208/21613 (8%)	542/21613 (21%)	283/21613 (11%)	277/21613 (11%)	2613	1798/2695 (67%)	214/2695 (8%)	390/2695 (14%)	197/2695 (7%)	96/2695 (4%)	2695
Age (years)†												
18–19	60/94 (64%)	6/94 (6%)	19/94 (20%)	5/94 (5%)	4/94 (4%)	94	73/105 (70%)	8/105 (8%)	13/105 (12%)	7/105 (7%)	4/105 (4%)	105
20–24	411/744 (55%)	63/744 (8%)	145/744 (19%)	67/744 (9%)	58/744 (8%)	744	522/755 (69%)	53/755 (7%)	99/755 (13%)	53/755 (7%)	28/755 (4%)	755
25–29	368/768 (48%)	66/768 (9%)	172/768 (22%)	79/768 (10%)	83/768 (11%)	768	496/772 (64%)	63/772 (8%)	121/772 (16%)	68/772 (9%)	24/772 (3%)	772
30–34	213/466 (46%)	43/466 (9%)	104/466 (22%)	59/466 (13%)	47/466 (10%)	466	315/467 (64%)	39/467 (8%)	72/467 (16%)	30/467 (9%)	11/467 (3%)	467
35–39	127/267 (48%)	17/267 (6%)	52/267 (19%)	39/267 (15%)	32/267 (12%)	267	169/267 (63%)	23/267 (9%)	36/267 (13%)	22/267 (8%)	17/267 (6%)	267
40–44	88/193 (46%)	14/193 (7%)	34/193 (18%)	29/193 (15%)	28/193 (15%)	193	124/194 (64%)	19/194 (10%)	32/194 (16%)	10/194 (5%)	9/194 (5%)	194
≥45	55/136 (40%)	8/136 (6%)	29/136 (21%)	15/136 (11%)	29/136 (21%)	136	99/125 (73%)	9/125 (7%)	17/125 (13%)	7/125 (5%)	3/125 (2%)	125
Total	1322/2668 (50%)	217/2668 (8%)	555/2668 (21%)	293/2668 (11%)	281/2668 (11%)	2668	1798/2695 (67%)	214/2695 (8%)	390/2695 (14%)	197/2695 (7%)	96/2695 (4%)	2695

Data are n/N (%). *Pearson's χ^2 for clitoral pleasure before surgical procedure was 301·6109 Pr<0·0001, and for pain before surgical procedure 230·0051 Pr<0·0001. †Pearson's χ^2 for clitoral pleasure before surgical procedure was 62·4061 Pr<0·0001, and for pain before surgical procedure 33·6787 Pr=0·29.

Table 1: **Clitoral pleasure and pain at first consultation according to year of consultation and age of patient (2938 patients with female genital mutilation)**

	Total	Pain	Discomfort	Slight improvement	Real improvement	Restricted orgasm	Regular orgasm
Preoperative clitoral pleasure							
Never	368	1/368 (<1%)*	14/368 (4%)*	85/368 (23%)†	139/368 (38%)†	88/368 (24%)†	41/368 (11%)†
Minor sensation	120	0/120	4/120 (3%)*	20/120 (17%)†	47/120 (39%)†	32/120 (27%)†	17/120 (14%)†
Pleasant without orgasm	196	0/196	0/196	18/196 (9%)†	76/196 (39%)†	77/196 (39%)†	25/196 (13%)†
Restricted orgasm	97	0/97	0/97	0/97	0/97	46/97 (47%)‡	51/97 (52%)†
Regular orgasm	53	0/53	0/53	0/53	0/53	12/53 (23%)§	41/53 (77%)‡
Total	834	1/834 (<1%)	18/834 (2%)	123/834 (15%)	262/834 (31%)	255/834 (31%)	175/834 (21%)
Preoperative pain							
No pain	486	1/486 (<1%)§	8/486 (2%)§	71/486 (15%)†	161/486 (33%)†	149/486 (31%)†	96/486 (20%)†
Minor discomfort during intercourse	124	0/124	1/124 (1%)‡	18/124 (15%)†	51/124 (41%)†	36/124 (29%)†	18/124 (15%)†
Moderate pain during intercourse	129	0/129	4/129 (3%)†	17/129 (13%)†	45/129 (35%)†	41/129 (32%)†	22/129 (17%)†
Strong to unbearable pain during intercourse	73	0/73	3/73 (4%)†	11/73 (15%)†	26/73 (36%)†	21/73 (29%)†	12/73 (16%)†
Pain without intercourse	28	0/28	2/28 (7%)†	7/28 (25%)†	7/28 (25%)†	7/28 (25%)†	5/28 (18%)†
Total	840	1/840 (<1%)	18/840 (2%)	124/840 (15%)	290/840 (35%)	254/840 (30%)	153/840 (18%)

Data are number of patients (%). We used pragmatic terms to define pain (clitoral pain), discomfort (clitoral dicomfort), slight improvement (little improved), real improvement (very improved), restricted orgasm (restricted in intensity or frequency), regular orgasm (regular in intensity or frequency). *Non-evaluable (reviewed case report forms, results set out in the ms). †Improved. ‡Unchanged. §Worse.

Table 2: **Results in postoperative functionality at 1 year in relation to preoperative symptoms**

Results

Surgery was done on 2938 women with female genital mutilation between Jan 1, 1998, and Dec 31, 2009. Most of them (2350, 80%) lived in France, and had access to the publicly funded health-care system. The mean age was 29·2 (SD 7·77) years, and age at excision was 6·1 (SD 3·5) years. (29%) patients attended the 1-year follow-up visit; 2072 women did not attend. Patients' characteristics did not differ between the initial group and the 1-year follow-up group (appendix). Patients came from French-speaking countries in West Africa, mainly Mali, Senegal, and Ivory Coast. 564 patients had undergone female genital mutilation in France. 146 (5%) of 2938 women (mainly from Djibouti, Ethiopia, and Egypt) had undergone type III mutilation with clitoral excision. 1762 (60%) 2938 of the women had type II mutilation accompanied by pseudo-infibulation and the remaining 35% had type II mutilation without pseudo-infibulation. 21 (<1%) of 2938 women had to have a pseudocyst removed before the clitoral reconstruction could take place.

The proportion of patients with female genital mutilation who had never experienced clitoral pleasure rose according to the year of attendance (table 1). Conversely, the proportion of patients who experienced pain diminished according to the year of attendance (table 1). Younger patients reported less clitoral pleasure than did older ones, but no age-related difference was noted for pain (table 2). Immediate complications after surgery (haematoma, suture failure, moderate fever) were noted in 155 (5·3%) of the patients, and 108 (3·7%) were briefly re-admitted to hospital. Minor adverse events (pain, late wound healing, or wound secretions) were treated in outpatients with no readmission, but clear instructions and medications were given to patients at discharge. Minor adverse events with brief readmission were noted in 155 (5·3%) cases: pain (32), haematoma (97), suture failure (13), and moderate fever (13) with a retention rate of 3·7% (108). At 1 year, no complications were recorded.

The figure shows some examples of aesthetic outcomes. We compared preoperative pain and clitoral pleasure with postoperative functionality at 1 year for 841 (97%) of the 866 women who attended the follow-up visit (table 3). 129 (35%) of the 368 women who had never had an orgasm before the procedure started to experience restricted or regular orgasms. Half the women who presented with restricted orgasm before the procedure reported a regular orgasm after it (table 2). Conversely, 12 (23%) of 53 patients who had regularly had orgasms before reported reduced orgasm afterwards. After reviewing non-evaluable patient case report forms, eight patients could be deemed as worsened. Thus, 20 patients in total were worsened for clitoral pleasure. After reconstruction, most patients reported an improvement, or at least no worsening, in pain and clitoral pleasure. Nine patients without pain before surgery had either discomfort (eight patients) or pain (one patient) at 1 year (table 2).

Expectations from surgery were the recovery of identity (feeling whole and recovering personal autonomy by rejecting the physical mutilation imposed on them by their family group)[21] for 2933 (>99%) of the 2938 women, an improved sex life for 2378 (81%) women, and pain reduction for 847 (29%) women. Some expectations were linked to preoperative status (table 3). For example, we noted a decrease in preoperative clitoral pain with year of

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attendance, with patients included after 2006 reporting less pain than did those included before that date (table 3). Most of the excisions had been done between the ages of 5 and 9 years, and we noted that preoperative pain was strongly related to age of excision (ie, patients who had undergone female genital mutilation later reported more pain). Conversely, preoperative clitoral pleasure increased with age of excision (table 4). Expectations for identity, sexuality, and pain were high both in women with clitoral pain, and in women seeking greater clitoral pleasure (tables 3, 4).

At 1-year follow-up, 430 (51·1%) of 841 women had orgasms, and 600 (70%) of 861 women had a visible glans (363 [42%] had a hoodless glans, 239 [28%] a normal clitoris, 210 [24%] a visible projection, 51 [6%] a non-visible but palpable projection, and three [<1%] had no change; appendix). Women with a visible glans (with or without hood) after reconstructive surgery were 2·2 times more likely to report normal postoperative orgasm than those without (adjusted 95% CI 1·40–3·43, p=0·007). We noted a significant association in both our univariate (p=0·01) and multivariate analyses (p<0·0068) between overall outcome and year of attendance, with the most recently operated patients having better overall results. Some prognosis factors are set out in the appendix (influence of pre-operative symptoms, ie, pain and clitoral function, on surgical outcome). In summary, the patients' age at attendance was not predictive of clitoral recovery, nor was their country of excision. The functional outcome was closely correlated with expectations and preoperative symptoms (p<0·0001). Postoperative appearance was significantly correlated with year of attendance (p=0·0007) and country of excision (p=0·0321). Age at attendance and age at excision were not predictive of aesthetic outcome.

	Proportion of patients in pain (%)	Crude OR	Adjusted OR	Adjusted 95% CI
Year of first consultation		0·0239*	0·0765†	
1998–2003	43% (92/216)	1	1	..
2004	50% (277/556)	0·92	0·91	0·63–1·31
2005	31% (178/578)	0·89	0·88	0·62–1·25
2006	25% (116/470)	1·37	1·30	0·90–1·87
2007	23% (104/456)	1·05	1·00	0·70–1·44
2008	24% (97/398)	0·97	0·92	0·64–1·33
2009	24% (62/264)	0·87	0·89	0·59–1·30
Age at excision		0·0065	0·0001	
≤1 year	27% (152/567)	1	1	..
1–4 years	28% (236/849)	0·70	0·7	0·61–0·92
5–9 years	34% (370/1091)	0·67	0·7	0·61–0·94
10–14 years	38% (143/375)	0·69	0·7	0·63–1·08
≥15 years	46% (25/55)	0·76	0·9	0·55–1·72
Excision country		0·0162	0·0379	
Burkina Faso	30% (64/217)	1	1	..
Côte d'Ivoire	33% (102/311)	1·30	1·36	0·94–1·97
Guinea	40% (82/203)	1·89	1·85	1·22–2·80
Mali	30% (211/699)	1·89	1·56	1·12–2·18
Mauritania	37% (40/109)	1·92	1·60	0·97–2·65
Senegal	31% (201/654)	1·33	1·23	0·88–1·71
West Africa	39% (19/49)	1·70	1·51	0·78–2·92
East and central Africa	44% (57/129)	1·20	1·12	0·69–1·81
France	26% (149/564)	1·47	1·19	0·84–1·69
Expectations		<0·0001		
Identity	10% (55/538)	1	..	..
Identity and sexuality	14% (214/1549)	4·00	..	..
Identity, sexuality, and pain reduction	77% (637/825)	4·55	..	..

Adjusted ORs are only shown for variables entered into the logistic regression. Interpretation: for each variable in the first OR column, there was a higher probability of a painful preoperative assessment if the OR was higher than that of the reference category (OR=1). The adjusted OR takes the other variables into account. *p value of the predictor in the univariate analysis. †p value of the predictor in the multivariate analysis (logistic regression).

Table 3: **Factors related to preoperative clitoral pain (total number of patients 2938)**

Discussion

We have shown that reconstructive surgery after female genital mutilation reduces local pain and restores clitoral pleasure. These unmet needs are inadequately assessed, because sequelae from female genital mutilation are not easily disclosed by women. Our work was not publicised, however, in 2004 the issue gained publicity (newspapers, television) after the decision of the French health-care system to reimburse the surgical procedure, which might have affected the the increase in recruitment in 2004. The proportion of patients with female genital mutilation who had never had clitoral pleasure rose with year of attendance. This rise could be related to changing patient expectations: patients initially came to seek pain reduction, but subsequently were more concerned with enhancing their sex lives.

Another point is the increased reporting of sexual problems in the younger patients compared with the older age groups. This might be linked to general apprehension towards sexuality and lack of experience in some young people. Furthermore, the women in our study were confronted with a particular dilemma: how to cope with conflicting, culturally determined sexual ideologies. These issues in female genital mutilation have been described in two studies.[17,22]

A single surgeon (PF) did all 2938 procedures using the same technique in the same hospital. All consecutive patients were included, and few data of those patients followed up were missing.

The attendance in this female population with genital mutilation, which is in constant flux, has never been studied; so what constitutes a good or bad follow-up rate is unknown. Under these circumstances, we felt satisfied with 29% (861 of 2938) follow-up at 1 year, and we suspect that this follow-up rate reflects the fact that many people may have remained in the Paris area. Nonetheless, the loss to follow-up is a major weakness of the study. It is always difficult to trace these patients, since they frequently move house and live in relative poverty.

Some studies have already been published on repair of female genital mutilation (panel);[13–15] however, they

	Proportion of patients with no pleasure (%)	Crude OR	Adjusted OR	Adjusted 95% CI
Year of first consultation		0·0239	0·0765	
1998–2003	58% (99/172)	1	1	
2004	55% (216/390)	0·92	0·91	0·63–1·31
2005	55% (293/535)	0·89	0·88	0·62–1·25
2006	65% (298/459)	1·37	1·30	0·90–1·87
2007	59% (267/454)	1·05	1·00	0·70–1·44
2008	57% (225/397)	0·97	0·92	0·64–1·33
2009	54% (141/261)	0·87	0·89	0·59–1·30
Age at excision		0·0065	0·0001	
≤1 year	65% (343/529)	1	1	..
1–4 years	56% (433/767)	0·70	0·7	0·6–0·9
5–9 years	55% (543/980)	0·67	0·7	0·6–0·9
10–14 years	56% (192/343)	0·69	0·7	0·6–1·0
≥15 years	58% (28/48)	0·76	0·9	0·5–1·7
Excision country		0·0162	0·0379	
Burkina Faso	48% (95/199)	1	1	..
Ivory Coast	54% (153/282)	1·30	1·36	0·94–1·97
Guinea	63% (121/191)	1·89	1·85	1·22–2·80
Mali	63% (405/640)	1·89	1·56	1·12–2·18
Mauritania	64% (63/99)	1·92	1·60	0·97–2·65
Senegal	55% (325/592)	1·33	1·23	0·88–1·71
West Africa	61% (28/46)	1·70	1·51	0·78–2·92
East and central Africa	52% (56/107)	1·20	1·12	0·69–1·81
France	57% (292/509)	1·47	1·19	0·84–1·69
Expectations		<0·001		
Identity	30% (146/487)	1	..	..
Identity and sexuality	63% (892/1411)	4·00	..	..
Identity, sexuality, and pain	66% (496/751)	4·55	..	..

Adjusted ORs are only shown for variables entered into the logistic regression. Interpretation: for each variable in the first OR column, there was a higher probability of a painful preoperative assessment if the OR was higher than that of the reference category (OR=1). The adjusted OR takes the other variables into account.

Table 4: **Factors related to preoperative clitoral pleasure (total population n=2668)**

included women (mostly from Somalia) with type III mutilation, which does not involve the systematic removal of the clitoris. The WHO definition of type III mutilation covers two states: with clitoris (closed but not cut) and without (cut and closed). These differences are clearly described in the Population Reference Bureau's 2010 report.[23] This is the reason why we did not use the technique described by Johnson and colleagues.[14] The aim of reconstructive genital surgery after female genital mutilation should be to restore the normal anatomy as far as possible.

Another point of discussion is population selection. In 2009, Andro and colleagues[24] published a case-control study designed to measure the effect of female genital mutilation on the health of women living in France, including 714 excised women versus 2168 non-excised women. The authors noted that only 55% of participants with female genital mutilation were aware of the availability of surgical repair, 27% were interested in having it done, but only 3% had actually gone ahead with it.

The design of the present study had several limitations, notably the fact that it was an open before-and-after assessment and we had no long-term follow-up data for non-operated women, so causality could not be shown. Because we could not envisage a sham procedure, a comparative randomised study was not feasible. We designed our own rating scales for clitoral pleasure and pain, and these should doubtless have been more standardised and validated formally. Assessments were based on assumption, but as they were done both before and after the surgical procedure, each patient was her own control. Moreover, having the same investigator for all the procedures and assessments might have decreased some biases.

No scales currently exist specifically to assess pain and clitoral pleasure, and more studies in this area would be welcome. Some studies have explored the quality of the sex lives of patients with female genital mutilation. Using the validated female sexual function index (FSFI), Catania and colleagues[25] reported significant differences between 57 infibulated women and 57 controls in desire, arousal, orgasm, and satisfaction, with mean scores higher in the group of mutilated women than in the control group. But these findings cannot lead to a clear conclusion since we believe that matching Italian women with African women constituted a major bias, and the FSFI has yet to be formally validated in a population of African women. Interestingly, in another group of patients,[25] the investigators noted that 86% of 137 women with female genital mutilation experienced orgasm (69% always). Even if these findings are limited by important group recruitment biases, they could be compared with the 91% of women who experienced orgasm (only 9% always) noted in another group of 58 youngest women. At last, the fact that the sample essentially consisted of women with type III mutilation from Somalia (no cutting) well have explained the high orgasm rate.

In another study,[15] 14 of 18 patients who had undergone defibulation and who were assessed on the FSFI scale before and after, came from Somalia (not cut) and reported no improvement in orgasmic function. Even though we used a pragmatic scale, we consider that our procedure did indeed correct type II and type III (with cutting) mutilations, by giving the women a more functional clitoris. Further research should include a large case-control study (excised and non-excised) women with the administration of a validated questionnaire such as the FSFI, to fully understand and describe the subpopulation concerned by clitoral repair.

We had no data about the sexual partners women had before and after surgery. Sexual pleasure varies from one sexual partner to another, and this could therefore be another major limitation. The complexity of the sexual dysfunctions that can be associated with female genital mutilation underlines, for us, the need to systematically offer sexual therapy to patients. Furthermore, these women might have experienced suffering

and violence in many different forms, which could result in post-traumatic stress disorder[4]—an aspect we are currently exploring.

564 patients in our series had undergone female genital mutilation in France, even though this practice has been strongly condemned in France. This exported tradition, hidden, and very much taboo, was first brought to light some 20 years ago in several French cities. Although no specific legislation has ever been passed, since 1978, 25 prosecutions (French Penal Code Art222) of circumcisors or parents have taken place in France (the only country where this has happened).[26]

From the public health point of view, these women were poor, and were only able to access surgical care because the French national health-care system bore the costs incurred. In most developed and all developing countries, reconstructive surgery is prohibitively expensive. Women have major unmet needs, and access to surgery is poor. In France, where most of the health expenses are reimbursed, there is only limited provision, because only a handful of surgeons have been trained in this technique, and fewer than ten offer this service in France. And yet, this surgery is rewarding for surgeons, in that we believe it genuinely helps women.

In developing countries, where the needs are greatest, reconstructive surgery is rarely accessible. Reconstructive surgery after female genital mutilation is not a priority in countries beset by public health emergencies. Informing international organisations that want to decrease female genital mutilation is key. They should help with reconstructive surgery.

Evidence-based health care should be the ultimate objective when developing a new surgical technique. Reconstructive surgery after female genital mutilation concerns very vulnerable populations, even in France. We focused our attention on the potential benefits for patients. We obtained safety data and proof of concept. We used our own prospective database, but more registries should be developed. We aim to conduct further investigations, such as comparative studies, and training programmes a multicentre evaluation programme should be implemented. The diffusion of a new technique takes time, and evaluation must be the first step.[27–29] The assessment of the surgery is challenged by factors, such as learning curves, quality variations, and perception of equipoise. A large-scale programme is mandatory for assessing this technique before any diffusion. The unmet needs are great indeed. To help these mutilated women more effectively, we must not only define the innovative surgery more clearly, but also consider time, communication channels, and the social system.

Clitoral reconstruction after female genital mutilation is feasible. It can certainly improve women's pleasure and lessen their pain. It also allows mutilated women to recover their identity. Age at excision and age at attendance do not affect outcome. The operation must be followed by an adaptation period, and can only ever restore a potential. The extent to which this potential is realised will depend on each individual woman's life course and the many complex factors known to be related to sexuality. Reparative surgery can be a liberating experience, but many women have to strike a difficult balance between their desire for this liberation and the ordeal of calling family values and local traditions into question.

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***Panel:* Research in context**

Systematic review

We searched PubMed with the keywords "female genital mutilation", "repair", "consequences", "sexuality", and "study", for all years and all languages, up to the end of December, 2011. Our objective was to select randomised trials and observational studies of more than 50 patients. We found 101 articles and selected the 17 highest level studies that are cited here.[3–5,7–9,11,13–16,18,19,22–25] This systematic review allowed us to describe both the immediate health complications and the long-term health risks. The frequency of clitoral pain is unknown, even though the reparative surgery was initially offered to alleviate pain. With the exception of our own earlier study, all existing publications on repair of female genital mutilation concern type III mutilation without clitoral excision. The defibulation technique they describe might improve women's sex lives by suppressing the dyspareunia that often accompanies this type of mutilation. Descriptions of the sex lives of excised women also mainly concern type III mutilation.

Interpretation

Our study of 2938 patients showed that among the 866 women who were followed up at 1 year, reconstructive surgery after female genital mutilation is effective. There was no mortality, only 5·3% morbidity and good feasibility. We operated mainly on women who had undergone type II excision. These patients reported pain reduction and an improvement in orgasmic function.

Contributors
PF and BC did the literature search and study design. PF did the data collection. AA, PF, and BC did the data analysis and interpretation. BC, PF, and AA wrote the report.

Conflicts of interest
We declare that we have no conflicts of interest.

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