

# Supraumbilical Transverse Incision for Cesarean Section in Severely Obese Patients: The Experience of a French Hospital from 2009 to 2014

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## Abstract

**Aim:** To describe our experience in supraumbilical cesarean deliveries in severely and morbidly obese patients (body mass index > 35 kg/m<sup>2</sup>) with a voluminous abdominal panniculus. **Methods:** A retrospective study in France between January 2009 and May 2014. Every woman who underwent a cesarean delivery with a supraumbilical incision was included through her digital medical record. A senior doctor made the decision for a supraumbilical skin incision after careful examination of the patient's anatomical conditions. **Results:** Twenty patients were included, for a total of 21 cesarean deliveries. Their mean body mass index 50 (40 - 61.7). Nineteen of them (95.0%) had an abdominal panniculus in supine "apron" position. Twelve patients (57.1%) had a scarred uterus. During the cesarean section, 14 (66.7%) had a segmentary hysterotomy. The median operative time was 49 minutes (32 - 70). Four patients (19.1%) had a postpartum hemorrhage and 4 (19.1%) a postpartum infectious complication, none of which were severe. **Conclusions:** In this specific population of severely obese women undergoing cesarean procedures, variations in anatomy require each patient's incision choice to be individualized. In women with a voluminous panniculus the supraumbilical skin incision seems to offer an adequate exposure to the peritoneal cavity and the lower uterine segment, therefore allowing to safely carry out the procedure. However a prospective study on a larger sample remains necessary to compare this technique to the classical cesarean procedure.

## Keywords

Cesarean, Supraumbilical, Obesity, Surgical Technique, Morbidity

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## 1. Introduction

Obesity has been defined by the World Health Organization as a body mass index (BMI = weight in kg/[height in cm]<sup>2</sup>) of 30 or more [1]. Its prevalence is increasing worldwide. In France, 15.0% of adults were obese in 2012, and 4.3% were severely so (BMI of more than 35), compared to 8.6% and 1.6% respectively in 1997 [2] [3]. Obese fertile women appear to have more adverse pregnancy outcomes compared to women with a BMI inferior to 30: increased risks of gestational hypertension, preeclampsia, gestational diabetes, anemia, induction of labor, instrumental delivery, cesarean section, and severe postpartum hemorrhage [4] [5] [6] [7]. Moreover their complication rate increases with their BMI [4] [5] [8] [9]. When they have a cesarean delivery, these women have more postoperative complications compared to non-obese patients: postpartum hemorrhage (34.9% of massively obese patients versus 9.3% [10]), parietal infections (adjusted OR = 4.8 [3.3 - 7.0] [6], 30% of wound infections [11]) and endometritis (32.6% for massively obese patients versus 4.9% otherwise [6] [10] [11]). It is why the gynecological community has been developing alternative surgical technique to try to diminish the complication risks, the current reference being the transverse subumbilical incision [12]. These techniques differ from the skin incision for both type and site: transverse or vertical, subumbilical or supraumbilical [13] [14] [15] [16]. To our knowledge there is currently no consensus on the surgical approach nor choice of abdominal incision in the obese women undergoing cesarean delivery.

The objective of this study was to describe our experience in managing cesarean deliveries in severely obese patients and to report complications related to this particular surgery.

## 2. Methods

We conducted a descriptive and retrospective study in a university Hospital in Caen, France, between January 2009 and May 2014. The Ethics Comity on Research in Obstetrics and Gynecology approved this study (CEROG OBS 2016-06-23). Every woman who underwent a cesarean delivery with a supraumbilical incision was included. They were identified through their digital medical records using the 4D software with the key-words “cesarean” and then “supraumbilical” among women who had cesarean deliveries. Their characteristics were then collected: medical background (age, BMI before the current pregnancy and at delivery, preexisting diabetes), past obstetrical history (parity and past cesarean delivery if multipara), pregnancy characteristics (gestational diabetes or preeclampsia), delivery (gestational age in gestational weeks (GW), indication of the cesarean section, peroperative events and complications, duration of operation, fetal birth weight, Apgar score and maternal postpartum characteristics (postoperative complication and its managing, ulterior pregnancy).

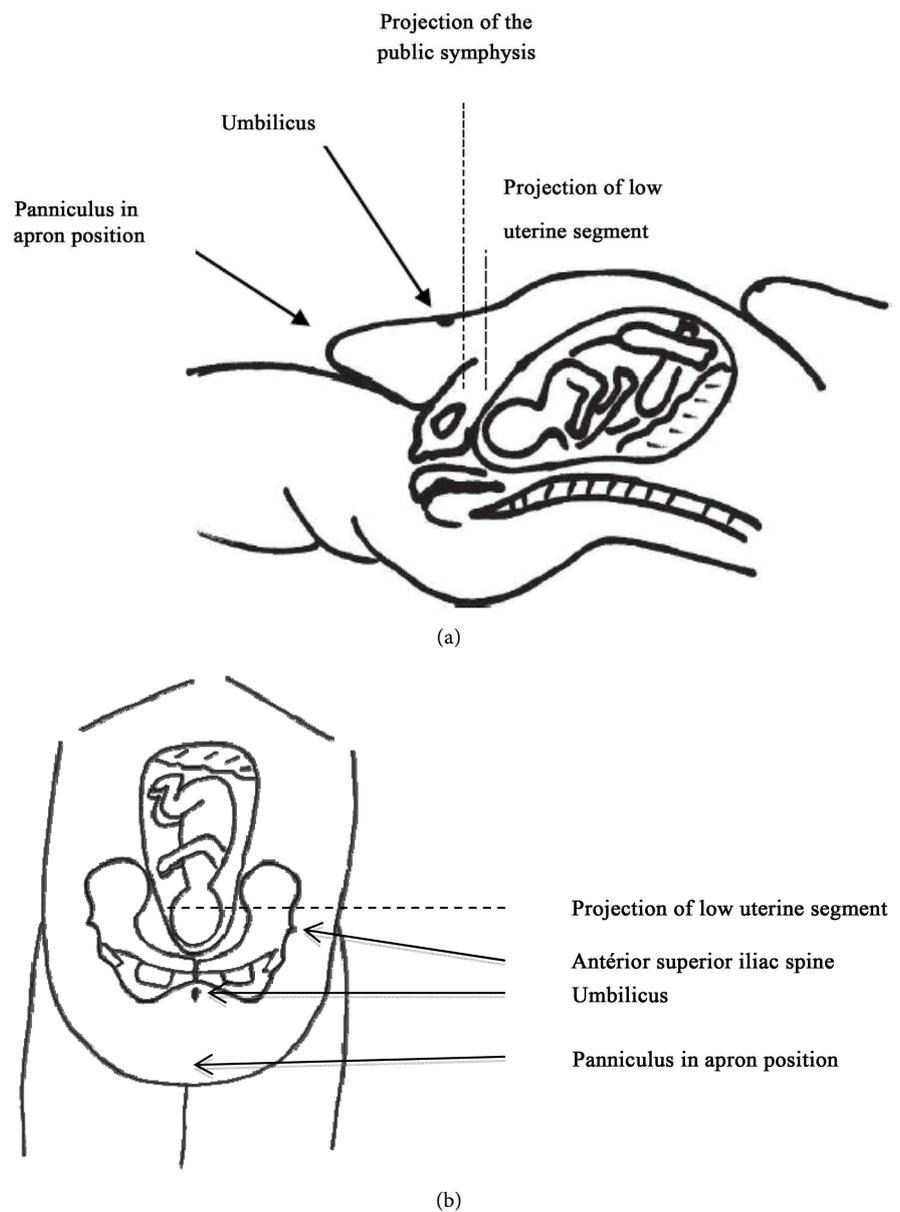
The indication for a supraumbilical skin incision was decided by one out of three senior practitioners after careful examination of the patient: when the

patient was lying on her back, her abdominal panniculus would have to be in the “apron” position, that is to say that the umbilicus was below the virtual line formed by joining the two anterior superior iliac spines (**Figure 1**). The decider did not need to be the surgeon on the day of the delivery.

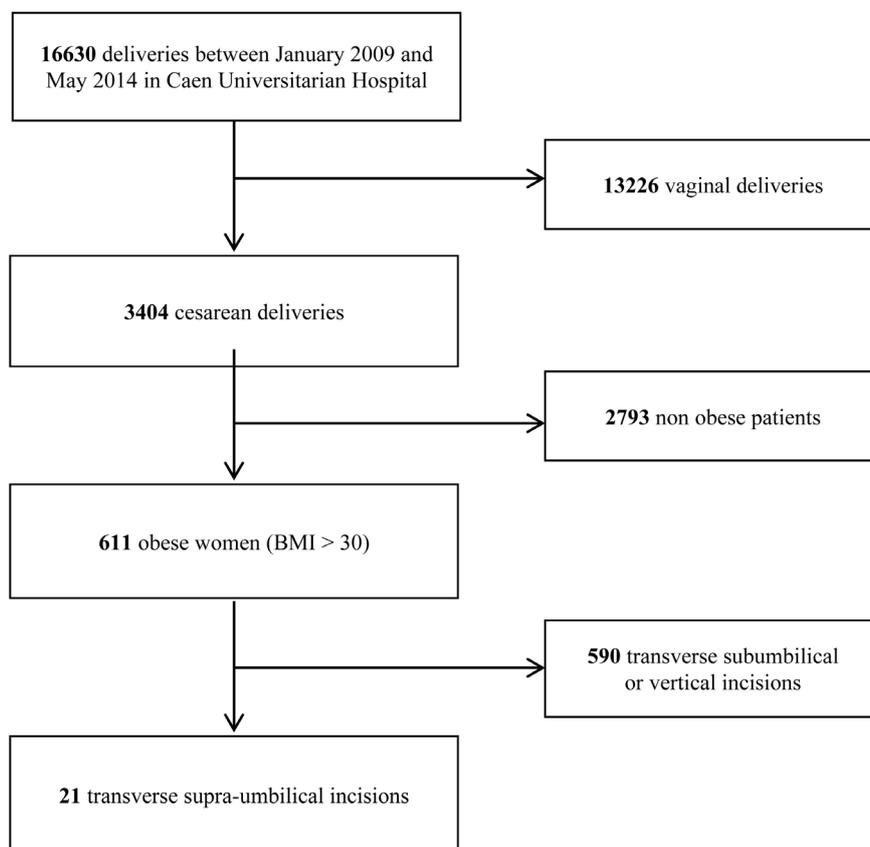
### 3. Results

Twenty patients were included (**Figure 2**).

**Table 1** shows our patients’ medical characteristics. **Table 2** presents the pregnancy and delivery’s characteristics, and **Table 3** the postpartum complications.



**Figure 1.** Illustration of the modified landmarks with a voluminous panniculus. (a) Side perspective [15]; (b) Front perspective.



**Figure 2.** Study flow chart.

**Table 1.** Patients preexisting characteristics, N = 21 pregnancies for 20 patients N (%) for binary and categorical variables, median (minimum-maximum) for continuous variables.

Characteristics (N = 21 pregnancies)	N (%) or
	Median (min - max)
<b>MEDICAL BACKGROUND</b>	
Age	35 (25 - 44)
Weight before pregnancy (kg)	126.5 (92 - 180)
Weight at delivery	136 (100 - 187)
BMI before pregnancy (kg/m <sup>2</sup> )	47 (35.4 - 57)
BMI at delivery	50 (40 - 61.7)
Abdominal panniculus in "apron" position	19 (95.0)
Preexisting diabetes	8 (38.1)
<b>PAST OBSTETRICAL HISTORY</b>	
Primiparous	4 (19.1)
Multiparous with unscarred uterus	5 (23.8)
Multiparous with scarred uterus	12 (57.1)
Among which: two past cesarean sections	5 (23.8)
<b>PREGNANCY</b>	
Gestational diabetes	10 (47.6)
Preeclampsia	3 (14.3)

**Table 2.** Obstetrical outcomes.

Characteristics (N = 21 pregnancies)	N (%) or
	Median (min - max)
Gestational age (gestational weeks)	38 (31 - 41)
<i>Timing of the cesarean section:</i>	
-elective	16 (81.0)
-emergency	5 (19.0)
<i>Indication of the cesarean section :</i>	
-severe preeclampsia	3 (14.3)
-breech position and diabetes	1 (4.8)
-failure of induction for gestational diabetes	2 (9.5)
-estimated macrosomia over 5000 gr	2 (9.5)
-macrosomia and past pathological deliveries <sup>a</sup>	2 (9.5)
-estimated macrosomia over 4250 gr and past cesarean delivery	4 (19.1)
-past cesarean delivery and BMI over 50	2 (9.5)
-two past cesarean deliveries	5 (23.8)
<i>Hysterotomy type:</i>	
-transverse segmentary	14 (66.7)
-transverse corporeal	4 (19.0)
-vertical corporeal	3 (14.3)
<i>Peroperative events:</i>	
-vacuum fetal extraction	2 (9.5)
-internal version	3 (14.3)
-complication <sup>b</sup>	1 (4.8)
-tubal ligation	3 (14.3)
-time between skin incision and fetal extraction (inminutes)	9.5 (4 - 24)
-duration of operation (in minutes)	49 (32 - 70)
<i>Fetal characteristics:</i>	
-fetal birth weight (in grams)	3900 (1220 - 4880)
-Apgar score (at 5 minutes of life)	10 (4 - 10)
-arterial pH	7.28 (7.15 - 7.37)

<sup>a</sup>History of shoulder dystocia and 4th degree perineal laceration; <sup>b</sup>Tear of the round ligament of the uterus.

**Table 3.** Postpartum complications.

Characteristics (N = 21 pregnancies)	N (%)
<i>Postoperative complication:</i>	
-postpartum hemorrhage	4 (19.1)
-postoperative ileus	1 (4.8)
-parietal infection	2 (9.5)
-endometritis	2 (9.5)
-need for a second surgery	0
-re-hospitalization	1 (4.8)
Ulterior pregnancy	2 (9.5)

Four patients (19.0%) had an emergency cesarean procedure (**Table 2**): three for severe preeclampsia and one for failure of induction for gestational diabetes. Only that latter had an intrapartum cesarean delivery, all the other were prelabor.

One of our patients had a second cesarean delivery two years after the first one. The first cesarean indication was gestational diabetes with suspicion of major fetal macrosomia, a narrowed pelvis (a computed tomography pelvimetry was performed because the patient's height was 1m50), and morbid obesity. The surgeon did not have any difficulty during the second supraumbilical operation, but the patient had a postoperative subcutaneous abscess treated by local anti-septic cares and did not need another surgery. The second cesarean section was done using the same skin incision. Adhesions between epiploic and the abdominal wall were removed with electric scalpel. An instrumental vacuum extraction was required because of the distance between the fetal head and the segmentary hysterotomy associated with the impossibility of operating manual pressure on the uterus due to the thickness of the maternal abdominal wall. She had a postoperative ileus in the early postpartum period, and was relieved after 48 hours with a nasogastric tube. Despite those complications, the patient declared herself to be satisfied with the procedures and is currently pregnant for the third time. The time between skin incision and fetal extraction seems a good criterion to evaluate the operative difficulties and the median time in our study was 9.5 minutes (range 4 - 24). The only operative complication was a tear of the round ligament of the uterus that needed a simple ligation.

However in the postoperative period four patients (19.1%) presented a postpartum hemorrhage (**Table 3**) that was stopped with the administration of sulprostone (a Prostaglandin E2 analog recommended by the French National College of Gynecology and Obstetrics [17]). Two (9.5%) patients had parietal infectious complications (one case of spontaneous reopening of the incision of four cm on the seventh day and one parietal abscess-the one described earlier-) and two (9.5%) presented an endometritis (one non-severe 12 days after delivery and one that caused a septicemia without septic shock due to *Citrobacter Frundeii*). None of them needed a second surgery and only the septicemic patient had to be rehospitalized for intravenous antibiotics.

Concerning our three cases of cesarean deliveries performed before term: one took place at 29 GW for severe preeclampsia and intrauterine growth restriction (the mother had preexisting hypertension), the second at 33 GW for preeclampsia and a past cesarean delivery, and the third one at 34 GW and 5 days for a past history of intrauterine fetal death at 35 GW, preexisting diabetes and a past cesarean delivery.

#### 4. Discussion

The patients in our study had different characteristics from the general population of pregnant women, as shown by comparing them to the data from the

French National Survey of 2010 [18]: they were older (33.3% were over 35 years old versus 22.9%), had more often preexisting diabetes (38.1% versus 0.5%) and were more often multipara (81.0% versus 72.3%). During their pregnancy they had more gestational diabetes (47.6% versus 7.2%) and preeclampsia (14.3% versus 2.8%). We had selected a specific population of women, and therefore their management had to be appropriate.

There is currently no consensus about this management. Medical literature diverges in its methods and its conclusions, and is very poor concerning this specific type of skin incision, as concluded Tipton *et al.* in 2011 in their literature research [19]. Houston and Raynor conducted a case-control study in Atlanta (USA) from 1989 to 1995 comparing 15 women with a past cesarean delivery with a *vertical* supraumbilical incision to 54 women with a Pfannenstiel incision (subumbilical low transverse incision) [20]. They did not find any significant difference between the two groups' complications (OR = 0.65 [0.12 - 3.06] for endometritis, OR = 1.25 [0.22 - 6.38] for wound separation) but their BMI differed significantly, which was a major bias. Bell *et al.* also compared the outcomes after cesarean deliveries with *vertical* sub or supraumbilical incision (N = 41) to cesarean with low transverse incision (N = 383) in a retrospective cohort from 2004 to 2006 in Georgia (USA) [21]. Women who had a vertical skin incision had more often a vertical corporeal hysterotomy (65.9% versus 7.3%,  $p < 0.001$ ), more blood transfusion (9.8% versus 1.6%,  $p = 0.01$ ) and wound infections (14.6% versus 7.6%,  $p = 0.03$ ). However the two groups differed for the BMI and the age (the patients who had a vertical skin incision were significantly heavier and older), and the statistical association disappeared after adjustment on age, gravidity, BMI, previous cesarean section, anesthesia type and gestational age at delivery. Marrs *et al.* also compared vertical to transverse skin incisions in a study including 3200 patients, but the transverse were low subumbilical incisions, thus with more infectious complications ( $p < 0.01$ ) [22].

Gunatilake and Perlow did a systematic literature review in 2011 concerning the management of obese patients, before, during and after their pregnancy [23]. They described and compared the different possibilities of skin incision when a cesarean section was needed. They found a higher complication rate when a vertical incision was performed compared to a transverse incision (34.6% versus 9.4%,  $p < 0.01$ ). Wall in 2003 also found an association between a vertical skin incision and wound complication (adjusted OR = 12.4 [3.9 - 39.3]) [24]. That is why they suggested that the incision site (subumbilical or supraumbilical) may be chosen according to the patient morphology [23]. This conclusion was coherent with our present approach.

Concerning women with a scarred uterus we found a lower rate of infectious complications compared to Chauhan *et al.*: they had 28% to 53% of infectious morbidity depending on whether the cesarean took place respectively in prepartum or intrapartum, among which 20% to 30% of endometritis and 8% to 23% of wound infection [25]. This disparity may be explained by the difference of our populations, especially considering their mean BMI (respectively  $57.5 \pm 9.8$  and

56.8 ± 8.4).

Tixier *et al.* led a descriptive retrospective study in 2003-2008 in France in which they described the two types of skin incisions to favor with severe obese patients (BMI > 40) [15]. The aim was to improve the access to the lower uterine segment by making the incision two finger-widths above the projection of the pubic symphysis. Accordingly 13 patients had a classic Pfannenstiel incision and 5 had a *transverse* supraumbilical incision, which they described in detail for the first time. They had a low postoperative complication rate compared to the previously cited studies: only one case of postpartum hemorrhage among 18 patients and 2 minor hematomas of the abdominal wall with spontaneous resorption, but they do not specify if those complications happened after a Pfannenstiel or a supraumbilical incision. Our study differs from Tixier's for various reasons. All of our patients had a supraumbilical incision (21 cases versus 5 of their patients). Our complication rate is higher, but few are severe. We would like to point out that our population had different hemorrhage and infection risk factors. For instance, the BMI differ: our patients mean BMI was 50.3 (range 40 - 61.7) versus 47.7 (range 40.1 - 60.8), and up to 57.1% had a scarred uterus versus 38.9% of their patients. The solution would be to conduct a study with adjustment on those confounders (age, BMI, parity, preexisting diabetes, preeclampsia and fetal macrosomia).

Our corporeal hysterotomy rate was higher (**Table 2**). Among those women, one had an emergency cesarean section at 29 GW for severe preeclampsia and intrauterine growth restriction; in that specific situation the lower uterine segment was not developed enough to do a segmentary hysterotomy. In the 6 other cases, the women had had a previous cesarean delivery; this implies that they will systematically have an iterative cesarean section in any ulterior pregnancy because of their two previous cesarean sections and severe obesity. Knowing this the surgeon chose to do a corporeal hysterotomy to facilitate the fetus extraction when the access to the lower uterine segment was not easy. If the fragility of a corporeal hysterotomy and the uterine rupture risk is well known (6% to 12%) [26], this risk remains exceptional out of the labor contractions. They also were all more than 35 years old, and 4 of them were more than 38. Moreover because of frequent peritoneal adhesions, access to the uterine corpus was simpler than to the lower segment. All these arguments made the decision of a corporeal hysterotomy easier.

Regarding postoperative complications in obese women compared to women with a normal BMI, Perlow *et al.* conducted a case-control study between 1987 and 1991 in California, USA, and compared 43 massively obese women to 43 randomly selected non-obese control patients [10]. The massively obese group was at significantly increased risk for emergency cesarean section (32.6% versus 9.3%,  $p = 0.02$ ), blood loss of more than 1000 ml (34.9% versus 9.3%,  $p = 0.009$ ) and postoperative endometritis (32.6% versus 4.9%,  $p = 0.002$ ). In comparison our complication rate is low (see **Table 3**), but our population is different; for instance the patients in Perlow's study had to weigh more than 300 pounds

(136.8 kg) to be included whereas 136 kg was our mean weight (range 100 - 187).

With 20 patients, this work is the largest French study that describes this type of specific incision and its complications. Tixier *et al.* had indeed 18 patients but only 5 of them had a transverse supraumbilical incision [15]. Stirrat *et al.* presented a series of 10 morbidly obese patients operated also with this technique and suggested that a suprapannus incision may benefit their surgical and anesthetic management [27]. Nonetheless our work remains of small size, without controls to compare them to in terms of adverse outcomes. We may have underestimated the number of eligible patients according to our criteria, because the decision to do this type of incision was neither made in an emergency situation if the surgeon was not experienced in this procedure, nor by anyone other than a senior doctor who was. However in our unit, the surgeons who have performed this technique would not go back to transverse subumbilical incisions for obese women with an important panniculus: the easier access to the peritoneal cavity, the surgeon's comfort and the lower postoperative complication rate in this population has convinced our team.

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