

Prognosis of Deliveries at the Regional Hospital of Saint Louis

Ousmane Thiam^{1*}, Sherif Cheikh Tourade Sarr², Djibryl Bahaid Sow², Sara Ndiaye⁴,
Ousmane Mbengue², Magatte Mbaye¹, Jean Charles Moreau²

¹Gynecologist Obstetrician, Assistant Master, University Gaston Berger, Senegal.

²Gynecologist Obstetrician, Saint Louis Regional Hospital Center, California, USA.

²General practitioner, Saint Louis Regional Hospital Center, California, USA.

¹Gynecologist - Obstetrician, Full Professor, University Gaston Berger, Senegal.

³Full Professor/Head of Department, UCAD, Senegal.

⁴Sociologist, Assistant Master.

*cassoumane@yahoo.fr, ousmane.thiam@ugb.edu.sn

***Corresponding Author:** Ousmane Thiam, Gynecologist Obstetrician UFR2S, University Gaston Berger, Maternity of the Regional Hospital Center of Saint Louis, Senegal.

Abstract

Few studies on the prognosis of cerebral uterine deliveries have been conducted in Senegal, particularly in the northern region of Senegal. To this end, we conducted a prospective study, whose purpose is to evaluate deliveries on scar uterus and improve care.

Methodology: This prospective descriptive cross-sectional study, which was conducted at the maternity ward of the Saint Louis Regional Hospital Center, was conducted from January 1st to July 31st, 2017.

Results: The deliveries on scar uterus accounted for 155 cases out of 2658 deliveries at the maternity ward of the Saint Louis Regional Hospital during the study period, a prevalence of 6%. The dominant age group was 25-32 years old. The average age was 28.9 years with extremes ranging from 20 to 41 years old.

We had a caesarean section rate of 52.3% and 47.7% vaginal delivery, of which 70.7% spontaneously expelled and 29.3% had a suction cup.

Caesarean section indications were mainly of maternal and adnexal origin, with 91.1% and 8.9% respectively. We had a bleeding hemorrhage of 9.7% and a dehiscence of the old scar 14% after a vaginal delivery. An intraoperative complication was noted of type sensory block deficit, resulting in a pain sensation peroperatively. In the immediate post operative period, post-caesarean peritonitis was noted. We had no maternal deaths. 2.3% of neonatal deaths were recorded during the study.

Conclusion: Progress remains to be made in the management of scar uteri deliveries. The materno-fetal prognosis may be improved by systematic and early reference of patients to the referral center.

Keywords: Caesarean section, cicatricial uterus, maternal mortality.

INTRODUCTION

The past decades have coincided with a rapid increase (growth) in caesarean section rates in most countries, including developing ones. Thus, the obstetrician is more and more confronted with the problem of delivery of scar uterus. [1-3].

In the United States, for example, in 1991 there was nearly 24% of cesarean delivery. A similar trend was observed in other high-level health development countries. In countries with a low level of health development such as Senegal, the same phenomenon was observed at the Gynecology and Obstetrics Clinic of the Dantec University Hospital of Dakar in 2001

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where it accounted for 25.1% of births. This cesarean inflation, here and elsewhere, poses the problem of the delivery route during subsequent pregnancies after cesarean section. [4]

The occurrence of pregnancy on a scar uterus is characterized by its high incidence, its multiple complications, its still significant rate of morbidity and maternal-fetal mortality. Complications include: dynamic dystocia, bleeding from delivery by the presence of placenta previa or increased, dehiscence of the uterine scar and uterine rupture. [5-6]

The vaginal uterine vaginal delivery trial developed rapidly in the early eighties. His indications have expanded to reduce the rate of iterative caesareans. [1]

Few studies on the prognosis of scar uteri deliveries have been conducted in Senegal, particularly in the northern region of Senegal. Thus, as part of the evaluation of professional practices, we had a study whose purpose is to participate in the reduction of maternal morbidity and mortality and neonatology.

The general objective was to evaluate the prognosis of scar uterus delivery at the Saint-Louis Regional Hospital.

Specific objectives:

- ↳ define the profile of women with uterine scarring;
- ↳ evaluate the delivery route on the scar uterus;
- ↳ to determine the future of the mother and the child.

METHODOLOGY

Type and Duration of Study

It is a prospective descriptive cross-sectional study, which took place from January 1st to July 31st, 2017. It was organized in the maternity ward of the Saint Louis Regional Hospital Center in Senegal.

Study Population

Our study focused on all women received for delivery at the maternity ward of the Saint-Louis Regional Hospital Center and carrying a scarred uterus during the aforementioned period. Any parturient with one or

more uterine scars of caesarean section was included in the study. However, we excluded the parturients with uterine scars other than caesarean section.

Variables Studied

The following variables were studied: age, occupation, marital status, ethnicity, antecedents, gestational status, parity, admission status, ANC, indication of uterine scar, examination clinical end of pregnancy, type of delivery, indication of caesarean section, complications of the vaginal approach, caesarean section complications, maternal prognosis and fetal prognosis. The data collected from the delivery records, the operative records and the medical records were recorded on a survey form developed for this purpose. This data was then entered into the Excel software and analyzed using the EPI info version 3 software.

For quantitative variables, we calculated

- the average and its ecratype
- the median and the extremes.

For each qualitative variable, we calculated the absolute and relative frequency as well as the confidence interval (CI).

For the analytical part, we set the significance threshold at 0.005, for each statically significant link, the RR and OR were calculated.

RESULTS

Frequency

During the study period, we had admitted 155 patients with a scarred uterus out of a total of 2658 births, a frequency of 5.83%.

According to the inclusion criteria, 86 parturients were eligible and accounted for 52.3% of all scar uterine deliveries.

Sociodemographic Characteristics

Age of parturients

The distribution of patients by age showed that the age group from 25 to 32 years was the majority. The average age of our patients was 28.9 years with the extremes of 20 and 41 years old. (Table I)

Table 1. Distribution of patients by age

Age groupe (years)	Frequency	Perrcentage %
20 à 24	22	25,9
25 à 32	37	42,5
33 à 37	20	23,4
38 à 41	7	8,2
Total	86	100

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Patients' Profession

Housewives were the most represented (41 cases representing 47.7%).

Marital Status

Of our patients, 82 were married, 95.3%. However, we had no single patient. Wolof ethnicity was the most represented (52 cases, 61.2%) during the study period.

Background

Medical history: The study of medical history revealed a hypertension in 29 patients (33.7%), a diabetes in 27 cases (31.7%) and Sickle cell disease for 5 cases (5.8%).

Gynecological Obstetric History

Gesture and Parity

The average gestational age was 3.31 ± 1.7 . The median was 3 with the extremes of 2 and 9. The paucigest and

multigestes were the most represented slices in our study.

The average parity was 3.16 ± 1.6 . The median was 3 with the extremes of 2 and 9. The pauciparas were the most represented parity.

History of Vaginal Delivery

Among patients with a scarred uterus, 21% had vaginal delivery before cesarean delivery and 19% had vaginal delivery after the previous caesarean section. For 60% of our patients, we had no idea how to deliver before or after cesarean section.

Indication of Previous Cesarean Section

The indication for anterior caesarean section was only specified in 80.4% of cases. Dystocia was the main indication (33 cases, 38.4%). Table II reports all the indications.

Table 2. Distribution of patients by indication of previous caesarean section.

Indication	frequency	Percentage %
Dystocia	33	38,4
SFA	18	20,9
Eclampsia	8	9,3
Exceeding term	5	5,8
Haemorrhage	3	3,5
Twin pregnancy	1	1,2
Procidence of the cord	1	1,2
Precious pregnancy	1	1,2
NP	16	18,6
Total	86	100

The majority of the patients (94% of the cases) had come of their own accord. Only 4% of cases were evacuated and 2% referred.

Prenatal Follow-Up

The number of CPN (Superior or equal to 4) required was respected in 53% of cases (46 patients)

General Clinical Examination

The average weight of our patients was 64.9 ± 8.2 . The median was 65 with the extremes of 40

and 85 kg.

The majority of patients had a size greater than 150, or 87% of cases.

Obstetric Examination

Term of Pregnancy

The majority of patients (58 cases, 67.4%) were full term during the study period. We had noted 10.5% of term overruns and 21% of prematurity. (Table III)

Table 3. Distribution of patients by term of pregnancy.

Terme of pregnancy	Frequency	Percentage %
30-33	4	4,7
34-37	14	16,3
38-40	58	67,4
Supérieur à 40	9	10,5
NP	1	1,1
Total	86	100

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The average uterine height of our patients was 33.6 ± 3.7 cm. The median was 34 with the extremes of 20 and 51cm. (Table V)

Type of Presentation

The presentation was cephalic for most of our patients (80 cases, or 93% of patients). The presentation of the site was only observed in one patient (1.2%).

Appearance of Fetal Heart Noise

BDCF were normal in 87.2% of patients. We found a case of tachycardia upon admission of the patient. On the other hand, for 11.6% of the patients no information was specified in relation to the BDCF. On arrival, the examination had noted the presence of the water bag in 71 patients, or 82.6%. One case of rupture of the water pocket was noted in 15 patients, ie 17.4%.

After rupture of the water pocket, the appearance of the amniotic fluid led to the diagnosis of fetal distress in 9 patients, ie 10.5% of cases.

Delivery Route

Of the patients with a scarred uterus, 48% had delivered naturally.

For 29.3% of them, an eviction aid was practiced using the vacuum sucker. Directed delivery was performed for all patients (100% of cases).

The uterine revision was systematic after the vaginal delivery, it allowed to objectify a dehiscence of the old scar in 6 patients, or 14% of the cases.

On the other hand, a caesarean section was performed for 45 patients representing 52% of the delivery cases. The indication for caesarean section was maternal 91.1% (41 patients) and foeto-adnexal for 4 cases (8.9%). A low transverse segmental hysterotomy was performed for all caesareans (100% of cases).

Become Maternal-Fetal

No case of maternal death was recorded in our series. Maternal morbidity cases were represented by:

- hemorrhage of the delivery (4 cases, ie 9.7%)
- postoperative peritonitis (1 case, ie 1.2%)
- an operative anesthetic incident (1.2%)

Newborns who had cried at birth with an Apgar score ≥ 7 in the first minute accounted for 88.5% of cases.

The average weight of newborns was 3087g +/- 662. The median was 3150g with the extremes of 1000 and 4800g.

77% of normal weight, 15% of low weight and 8% of macrosomia were noted.

Two cases of early neonatal deaths (at the third day of life) were recorded representing 2.3% of cases; in relation to prematurity.

DISCUSSION

Frequency

During the study period, the prevalence of scar uterus delivery was 5.83%.

Confronted with the data of the literature, our rate of delivery on cicatricial uterus is superior to that of: Niambelé (Bamako) [7] which yields 3%; Ouattara (Bamako) [8] who finds 3.7%; Van Der Walt [6] in South Africa (3.7%); Tshilombo [4] in Congo (2.6%) and Cissé [9] in Senegal, which found 1.5%. On the other hand, this rate is lower than that of: Diadhou [10] in Senegal which recovers 7.5%; Anderson [11] in Canada, which finds 7.6%; Flamm [12] in the US, which found 9.2%. It is however close to that of Boisselier [9] in France which finds 5.3%

These findings confirm the high frequency of scar uteri deliveries that obstetricians are increasingly facing.

Sociodemographic Characteristics

The average age of our patients was 28.9 years. It is superimposable to the results reported by Cissé [9] who had an average age (29 years) and Ba [14] (27.38 years).

The most represented age group in our series was 25 to 32 years, while Diarra [15] reports a majority age group between 21 and 30 years.

The majority age groups for these different series are superimposable on the period of female genital activity.

According to the occupation, the housewives were the most numerous: 47.7%. Coulibaly [16] found 96% of housewives, while Tégouété [17] reported 86.01%.

This situation could be explained by the still very low level of literacy of women in our regions, so they focus mainly on households.

Antecedents

In our series, paucigestas and multigestes predominated with 43% of cases. Coulibaly [16] found 33.41% for large multigestes. Pauciparas were the most represented (48.8%), followed by multiparas (38.5%). These results are comparable to the work of Cisse [9] who found 45.5% of pauciparas. Dystocia was the most common indication for anterior Caesarean section (34.8%), followed by acute fetal distress with 20.9%. Sidibé [18] found 15.9% and 14% respectively for the same indications. The indication for anterior caesarean section was unknown in 18.6%. This is explained by the lack of information of patients about their state of health, by their low level of education and also by the insufficiency of archiving. According to standards and protocols, 53% of patients in our series had performed a number of CPN greater than or equal to 4. These proportions are higher than those reported by Sidibé [18] in a series of deliveries on scar uterus in the region of Kayes. This can be explained by the fact that there is an antenatal care unit in our department where there is frequent oversight of guardianship.

In our study, 94% of the patients had come from themselves, in connection with the fact that there is in our service a unit for the management of at-risk pregnancies in which all the cases followed in antenatal for uterus are treated. . Koumaré [19] found 87% of patients.

Vaginal Birth

During the study period, vaginal delivery was a success in 48% of cases. Ouattara [20] reports in his series a value (37%) lower than ours. On the other hand, in the international literature, the authors [4, 21-23] report proportions much higher than the rate of vaginal delivery that we have found. This is explained by our attitude with a surgical tendency (Caesarean section of prudence). However, of the patients who had vaginal delivery, 70.7% had expelled spontaneously, 29.3% had benefited from instrumental extraction (suction cup). The proportion of instrumental extraction in our series was higher than those reported by other authors: Sidibé [18] (18.4%); Tshilombo [4] (2%); Hamet [24] (4.6%) and Picaud [21] (13.6%).

This is mainly due to our option to almost always carry out an eviction aid in the case of a cicatricial uterus.

The history of vaginal delivery of the parturient before the uterine scar is a factor in the success of the uterine test. Benzineb [25] found that the percentage of women who successfully delivered vaginal uterine vaginal delivery was higher when there was one or more vaginal deliveries before the previous caesarean section.

The history of vaginal delivery after the uterine scar significantly increases the rate of vaginal delivery after Benzineb [25]. Similarly, an anterior caesarean whose indication is not related to a pelvic obstacle, the commitment of the presentation at the end of pregnancy and the good ripening of the cervix are factors of success of the uterine test.

Caesarean Section

In recent years, the rate of caesarean section has been steadily increasing in several industrialized countries. In Great Britain and Scotland, the rate of caesarean section rose from 16% in 1995 to 21.5% in 2003. At the University Hospital Center in Dakar, the rate of Caesarean section also increased from 12% in 1992 to 17.5% in 1996, reaching 25.2% in 2001 [26].

This rate of cesarean section inflation occurs despite World Health Organization (WHO) recommendations not to exceed 10-15% [26].

We note that the caesarean section rate in our study (52%) is high even though it is related to the number of scarred uteruses received during the same period. High or very low rates of caesareans can be dangerous, but it is unclear what the optimal rate is. Although the World Health Organization has recommended a caesarean section rate of between 5% and 15% in the population since 1985 [26], no experimental data are available to establish an interval or range. optimum percentages. More and more studies have pointed out the negative effects of a high rate of caesarean section [26]. It should be noted that the proposed 15% upper limit is not an objective to be achieved but rather a threshold not to be exceeded. In any case, in most developed countries and in many urban areas in developing countries, caesarean section rates exceed this threshold. In fact, what is most important is that all women who need a caesarean section can actually benefit without considering a threshold.

Caesarean section indications for our patients were mainly of maternal and adnexal origin with 91.1% and 8.9%, respectively. These indications do not differ from those reported by other authors [7,27-30].

During our study, we performed 100% low transverse segmental hysterotomy. These results are comparable to the work of Ouattara [20] (99.6%); Ba [21] (98%) and Lebrun [31] (98.3%).

This is explained by our major concern to obtain uterine scars of good quality according to the protocols applied in the service.

To reduce caesarean section rates on scar uteri, it is essential to analyze the indications according to the different groups of Robson's classification, continue to practice regular daily discussion of obstetric records on a case-by-case basis and continue to promote attempts to vaginal delivery on siege and multiple pregnancies during delivery on scar uterus. In our department, we must also think about limiting the first cesarean to the primipara.

At present, the heterogeneity of the Caesarean section classification does not permit meaningful comparisons. In particular, we note a lack of clarity, as far as operative indications and relevant obstetric history, in front of a united scar uterus.

Maternal and Fetal Prognosis

No maternal deaths were recorded during the study period. Ouattara [20] reported 3 cases of death (0.5%) by CIVD; Hamet [24] lamented two maternal deaths: one by OAP, the other by haemorrhage.

No maternal deaths were noted in the Niambelé series; Benzineb [25]; Ba [14] and Cissé [9].

Maternal morbidity was represented by bleeding from delivery 9.7% and dehiscence of the old scar 14% after vaginal delivery. In the immediate postoperative period, we had post-cesarean peritonitis. These results are superimposable to those of other authors [20].

The regular presence of qualified personnel for any risky delivery, the availability of the Physician Gynecologist and the rapid management of obstetric emergencies, contribute significantly to the reduction of maternal deaths. This gives our service the role of reference in the northern region of Senegal.

In our study, the Apgar score was greater than 7 in the first and fifth minute respectively in 88.5% and 95.4% of cases.

In the literature, Koumaré [32] found 97.4% of cases with an Apgar score greater than 7 in the first minute. The average weight of newborns during the study was 3087g, the newborns who had a normal weight were 77%, superimposed on the results of Koumaré and Diadhiou.

We noted that our neonatal death rate (2.3%) was high. It is, nevertheless, lower than that (2.9%) found by Diadhiou [28]; Tshilombo et al. [4] (9%) and Abassi [30] (5.9%). Likewise, the absence of neonatal mortality in the Tunisian series [8] shows that progress is possible in the field of emergency neonatal care in countries with low levels of health development, particularly during uterine deliveries. scar.

In sum, mortality and fetal morbidity in our study remain high. These data show that the conditions of neonatal care must be improved both in qualified personnel (pediatric neonatologists, nursery nurses) and equipment.

CONCLUSION

The results of our study allow us to affirm that it is possible to improve the prognosis of deliveries on scar uterus in a context of scarcity of resources through a process of care. The sustainability of its achievements will come through

- a systematic and early reference of patients with scar uteri to the reference center,
- the creation of functional and efficient surgical relay centers at the periphery
- the establishment of a device for information, monitoring and communication performance vis-à-vis patients.

REFERENCES

- [1] TUCKER MARTIN J., HAUTH J.C., HODGKINS P., OWEN J., WINKLER J.C. Trial labor after one- or two-layer closure of a low transverse uterine incision. *J. Gynecol. Obstet. Biol. Reprod.*1993; 168: 545-546.
- [2] T. SCHMITZA. Special clinical situations, maternal or fetal, influencing the choice of mode of delivery in case of previous cesarean section. *Journal of Gynecology Obstetrics and Biology of Reproduction* (2012) 41, 772-781.

Prognosis of Deliveries at the Regional Hospital of Saint Louis

- [3] VENDETTIELLI F, BOUDINET F, TABASTE J.L. Becoming obstetrical uteri scar. J. Gynecol. Obstet. Biol. Reprod.1992; 87, 4: 191.
- [4] TSHILOMBO K.M., MPUTU L., NGUMA M., WOLOMBY M., TOZIN R., YANGA K. Delivery in the Zairian pregnant woman previously caesarized. J. Gynecol. Obstet. Biol. Reprod.1991; 20: 568-574.
- [5] THOULON J.M. Prohibited acts on the gravid scar uterus J. Gynecol. Obstet. Biol. Reprod.1981, 76: 135-139.
- [6] VAN DER WA WALT, CRONJE HS, BAM RH. Vaginal delivery after one cesarean section. Gynecol Obstet1994; 46: 271-7.
- [7] NIAMBELE A. Delivery of cicatricial uterus at the Ref Center of Commune II of Bamako. About 114cas, 2010.
- [8] OUATTARA A. Delivery of cicatricial uterus to the CS Ref CV of the District of Bamako about 570 cases. Thesis of Med. Bamako. 2004, 85.
- [9] CISSECT; EWAGNIGNONE; TEROLBEI; DIADHOU F. Delivery of scar uterus at Dakar University Hospital. J. Gynecol. Obstet. Biol. Reprod.1999; 28; 6: 556-562.
- [10] DIADHIOU M T E. Scarred uterus delivery at Dakar University Hospital, about 288 cases. Medical Thesis 2004 N ° 115.
- [11] ANDERSON GM, Determinants of the increasing cesarean birth rate. N Engl J Med 1994; 311: 887-92.
- [12] FLAMM B NEWMAN LA, THOMAS SJ, FALLON D, YOSHIDA
- [13] MM. Vaginal birth after cesarean delivery: result of a 5 years multi-center collaborative study. Obstet Gynecol 1990; 76: 750-4.
- [14] CENTER FOR DISEASES CONTROL. Rates of Cesarean Delivery - United States 1991. M. M.W.R., 1993; 42: 285-289.
- [15] DJEME D. Evaluation of the use of the partograph in the reference health center of commune II of Bamako. Medical thesis; 2001.
- [16] COULIBALY A K. Cesarean section at the Koutiala Ref. Health Center: Maternal fetal indications and prognosis. About 1412cas; 2007
- [17] TEGUETE I. Clinical and epidemiological study of caesarean section at the maternity hospital of the «G» Point National Hospital, 1991-1993 (about a case study of 1544 cases, Med BKO thesis, 1996, 133p, # 17.
- [18] SIDIBE Y B. Scarred uterus delivery at Fousseyni Daou Hospital in Kayes. About 214cas, 2010
- [19] KOUMARE Z. Delivery of scar uterus at the Reference Health Center of Commune V of Bamako, 2009
- [20] OUATTARA A. Delivery of cicatricial uterus to CS Ref CV of Bamako District about 570 cases. Thesis of Med. Bamako. 2004, 85.
- [21] PICAUD A, NLOME-NZE AR, OGOWET N, ENGOGAH T, ELLA-EKOGHA R. Delivery in the scarred uterus. About of 606 boxes in 62193 deliveries. J. Gynecol. Obstet. Biol. Reprod.1990 Jun; Flight 85 (6).
- [22] HERLICOVIEZ M., VON THEOBALD P, BARJOT P, MARIE G., UZAN M., MULLER G., LEVY G. Conduct in front of a cicatricial uterus. J. Gynecol. Obstet. Biol. Reprod. 1992; 87, 4: 209-218.
- [23] MEEHAN F.P., BURKE G., KEHOE J.T, MAGANI I.M. True break dehiscence in delivery following prior section. J. Gynecol. Obstet. Biol. Reprod .1990; 31: 249-255.
- [24] HAMET TIDJANI A, A GALLAIS, M GARBA. The delivery of cicatricial uterus in Niger: about 590 cases. Med. On Afr. Black: February 2001, Volume 48 (2): 63-66.
- [25] BENZINEB N, BELLASFAR B, BOUGUERRA B, AMRI MT, SFAR R. Vaginal delivery after caesarean section. About 173 uterine tests. J. Gynecol. Obstet. Biol. Reprod. 1998.
- [26] LAILAB. Parity, obstetric prognosis and indication of caesarean section in a Reference Center in Dakar: 6 years of experience, 2018, 11
- [27] DIALLO A. «Study of obstetric needs not covered in the Koutiala circle».
- [28] J.-B. HAUMONTE, M. RAYLET, L. SABIANI, O. FRANKE, F. Bretelle, L. BOUBLI, C. of ERCOLE. What factors influence the delivery route in case of vaginal uterus attempt? Journal of Gynecology Obstetrics and Biology of Reproduction (2012) 41, 735-752.

Prognosis of Deliveries at the Regional Hospital of Saint Louis

- [29] COULIBALY A K. Caesarean section at the Koutiala Ref. Health Center: Maternal fetal indications and prognosis. About 1412cas; 2007
- [30] ABBASSI H., ABOULFALAH A., EL KARROUMI M., BOUHAYA S., BEKKAY M. Delivery of cicatricial uteri: Can the uterine test be enlarged? J. Gynecol. Obstet. Biol. Reprod.1998; 27, 4: 425-429.
- [31] LEBRUN F, AMIELMENT C, SUREAU C, Conduct in front of a cicatricial uterus. Medical Tunisia 1995; 42: 391-6
- [32] KOUMARE Z. Scarred uterus delivery at the Reference Health Center of Commune V of Bamako, 2009.

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