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RESEARCH ARTICLE

EVALUATION OF THE IMPLEMENTATION OF THE ERAS PROTOCOL AFTER CESAREAN SECTION

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Abstract

Objective: To evaluate the effects of implementing an Enhanced Rehabilitation After Surgery (ERAS) protocol in patients who have undergone caesarean section, compared to standard management.
Methods: Prospective, comparative and single-center study including 470 patients divided into two groups: ERAS group (n=230) and control group (n=240). The outcomes included: pain management, time to resumption of feeding and mobility, length of hospital stay, post-operative complications, and satisfaction.
Results: The ERAS protocol allowed for faster recovery: removal of the urinary catheter at 2:47 a.m. vs. 8:50 a.m., resumption of liquid feeding at H3 (vs. H9) and solid food at H6 (vs. H23), first rise at H10 (vs. H22). Pain management was significantly better in the ERAS group, with reduced opioid use. The average duration of hospitalization was slightly shorter (48 hours vs. 52 hours). No increased risk of complications was observed.
Conclusion: The ERAS protocol significantly improves post-caesarean section recovery without increasing the risks, while promoting a more positive experience for patients.

Introduction:

Enhanced Recovery After Surgery (ERAS) protocols, developed in the late 1990s by Kehlet, aim to reduce the response to surgical stress and accelerate the patient's return to physical and mental functions. This multidisciplinary approach is based on coordination before, during and after the procedure, and requires the involvement of the entire care team.

According to the recommendations of the HAS (2016), the pillars of an ERAS program are patient information, anticipation of care and discharge, optimal pain management, reduction of surgical stress and maintenance of autonomy.

In this context, our department conducted a study to evaluate the impact of implementing the ERAS protocol after caesarean section. The analysis focuses on several parameters: urinary catheter removal, pain management, length of hospital stay and patient satisfaction.

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Patients & Methods:

Patients:

The study was conducted in the maternity department of the Abderrahim HAROUCHI Mother-Child Hospital of the Ibn Rochd University Hospital in Casablanca, a level 3 reference center. This is a prospective, single-center, descriptive study involving a sample of 470 patients. The study took place over thirteen months, from September 2023 to October 2024. It covered all patients who should benefit from a caesarean section, whether scheduled or performed in emergency, under spinal anaesthesia or general anaesthesia, and meeting the inclusion criteria. All cooperating patients were included, whether or not they had a scarred uterus. On the other hand, patients with a serious maternal pathology contraindicating the application of the early rehabilitation protocol, such as severe preeclampsia or requiring monitoring in intensive care, as well as patients who are not cooperating or have no means of communication (especially those living alone without a telephone) were excluded from the study. The sample was divided into 2 groups: 240 patients in the control group and 230 in the ERAS group. After applying the exclusion criteria, 10 patients were excluded from the ERAS group and 20 from the control group.

Methods of Statistical Analysis:

Data were captured and analyzed using SPSS version 25 and Excel 2016. Quantitative variables were expressed as means ± standard deviation or median with their extreme values, depending on their distribution. In order to compare the results between the control group and the ERAS group, multivariate statistical analyses were performed. Mean comparisons were performed using Student's t-test, while proportion comparisons were based on the Chi^2 test. The statistical significance threshold was set at $p < 0.05$.

Results:

The study comparing patients who received the ERAS (Enhanced Recovery After Surgery) protocol to a control group showed similar population characteristics between the two groups. The average age of the patients was about 29 years, with a comparable BMI around 29. The percentage of first-time mothers was slightly lower in the ERAS group. Gestational age was lower in the ERAS group (37 WA + 6 days) than in the control group (39 WA + 1 day). There was a slightly higher proportion of scarred uteruses in the ERAS group (40.9% vs. 35%).

Regarding the indications for caesarean section, non-reassuring fetal condition (NRFS) was the main cause in both groups, although more common in controls. Dystocic presentations were more common in the ERAS group. The suspicion of uterine dehiscence was significantly higher in this same group. In terms of associated pathologies, gestational diabetes and dysthyroidism were more common in the ERAS group, while twin pregnancies and asthma were more represented in controls. Anaemia remained common in both groups (**Table 1).**

Table 1: Demographic characteristics of the 470 patients.

Variable	Control Group (N=240)	RAAC Group (N=230)
Number of patients	240	230
Average age (years)	28.09 ± 6.45	29.52 ± 6.9
Average BMI (Kg/m²)	29.08	29.15
Parity - 1	106 (44.1%)	88 (38%)
Parity - 2	50 (20.8%)	60 (26%)
Parity - 3	60 (25%)	52 (23%)
Parity - 4	22 (9.1%)	20 (9%)
Parity - 5	2 (0.8%)	2 (1%)
Parity - >5	0 (0%)	6 (3%)
Average gestational age (weeks)	39w+1d ± 1.55	37w+6d ± 1.88
Scarred uterus	84 (35%)	94 (40.9%)

Previous cesarean sections - 0	156 (65%)	136 (59%)
Previous cesarean sections - 1	28 (11.7%)	52 (23%)
Previous cesarean sections - 2	42 (17.5%)	26 (11%)
Previous cesarean sections - 3	14 (5.83%)	14 (6%)
Previous cesarean sections - >3	0 (0%)	2 (1%)
Indication - EFNR	104 (43.3%)	55 (24%)
Indication - Dystocic presentation (breech, transverse)	34 (14.7%)	45 (19.9%)
Indication - Scarred uterus	54 (22.5%)	38 (16.5%)
Indication - Macrosomia	20 (8.3%)	17 (7.8%)
Indication - Suspected dehiscence (Minimal bleeding)	6 (2.5%)	22 (9.5%)

Intraoperatively, the majority of caesarean sections were performed under spinal anaesthesia (83%). The main complication was hypotension, well controlled by ephedrine and norepinephrine. The anesthetic protocol was well coded **(Table 2),** based on the combination of bupivacaine and fentanyl, antibiotic prophylaxis with amoxicillin-clavulanic acid, administration of Syntocinon, and crystalloid filling. The average duration of caesarean sections was 45 minutes in the ERAS group, compared to 41 minutes in controls, and the majority of interventions were performed during the day.

Table 2: Anesthetic modalities:

Anesthesia Mode / Morphine Use	Control Group - N	Control Group - %	RAAC Group - N	RAAC Group - %
Spinal anesthesia	168	70.0	191	83.0
Combined spinal-epidural anesthesia	17	7.0	11	5.0
Epidural anesthesia	7	3.0	5	2.0
General anesthesia	48	20.0	23	10.0
Use of intrathecal or perimedullary morphine	206	85.7	3	1.3

Postoperatively, recovery was significantly faster in the ERAS group. The removal of the urinary catheter was done on average at 2:47 a.m. compared to 8:50 a.m. in the control group, with earlier urination as well. Feeding was resumed earlier: liquids to H3 and semi-liquids to H6 in the ERAS group, while these delays reached H9 and H23 in the control group. The first rise was also earlier in the ERAS group, around H10 against H22. Pain management was significantly improved with ERAS: VAS scores were lower from day 0, and the use of level 2 analgesics (such as tramadol) and morphine reminders were much less frequent. TAP blocks were used in 70% of ERAS cases, while no patients in the control group received them **(Table 3).**

Table 3: Postoperative assessment of pain management and analgesics.

Parameter	Control Group	RAAC Group
Analgesics used: Paracetamol + Acupan 20mg	100 %	100 %
Analgesics used: Paracetamol + NSAIDs	89 %	56 %
Analgesics used: Step 2 - Tramadol	34 %	3 %
TAP block	0 %	70 %
Scar infiltration	0 %	10 %

Need for morphine re-administration	72 %	4 %
Pain score (VAS) - Day 0	5.07	2.69
Pain score (VAS) - Day 1	5.11	3.8
Pain score (VAS) - Day 2	3.36	2.4
Pain score (VAS) - Day 3	2.7	2.1

Intestinal transit resumed on average after 2.5 days in both groups. However, the length of stay was shorter in the ERAS group (48 hours versus 52). Infection rates were slightly different but overall low: some UTIs in the ERAS group and some scar infections or other infectious complications in the control group. Finally, the analysis of the factors influencing certain postoperative outcomes showed that the type of anesthesia played on pain on day 1, with epidurals being associated with the lowest scores. The resumption of bowel movements was slightly slower in obese patients and those who had an emergency caesarean section. For the risk of infection, spinal anaesthesia appeared to be protective compared to general anaesthesia, and a scarred uterus also appeared to play a protective role.

Table 4: Comparison of postoperative effects between the ERAS group and the control group.

Parameter	Control Group	RAAC Group	p value	OR	95% CI
Postpartum catheterization	38 (15.83%)	1 (0.43%)	$<10^{-6}$	26.35	[4.26–1084.86]
Scar infiltration	0 %	10 %	$<10^{-6}$		
Need for morphine re-administration	72 %	4 %	$<10^{-6}$	29.7	
Analgesics used: Paracetamol + Acupan 20mg	100 %	100 %	-		
Analgesics used: Paracetamol + NSAIDs	89 %	56 %	<0.05	4.9	[2.4–10.9]
Analgesics used: Step 2 - Tramadol	34 %	3 %	<0.05		
Pain score (VAS) - Day 0	5.07 (N=240)	2.69 (N=230)	12		
Pain score (VAS) - Day 1	5.11 (N=240)	3.8 (N=230)	12		
Pain score (VAS) - Day 2	3.36 (N=240)	2.4 (N=230)	-		
Pain score (VAS) - Day 3	2.73 (N=240)	-	-		
Time to bowel movement (days)	2.62 (N=240)	2.51 (N=230)	NS (0.28)		
Length of hospital stay (hours)	52H (N=240)	48H (N=230)	0.01		
Infection rate - total	12 (5%)	9 (3.9%)	0.42		
Urinary infection rate	7 (2.9%)	5 (2.17%)	-		
Non-urinary infection rate	5 (2.1%)	4 (1.4%)	-		

* Abbreviations: OR = odds ratio, 95% CI = 95% confidence interval, EVN = numerical verbal scale [0-10], NS = not significant, - no statistical analysis performed, ° Fischer test, * Mann Whitney nonparametric mean comparison test

Patient satisfaction was high. The majority felt well supported and informed, and 87% said they recovered better than they feared. More than 90% were able to breastfeed early after the procedure.

Discussion:

Our study confirms the benefits of the ERAS protocol in obstetrical settings, particularly for caesarean sections. On the anesthetic side, the approach we have adopted – mainly based on spinal anesthesia – is in line with the current recommendations of the SFAR and other work that favor locoregional anesthesia, especially for elective caesarean sections. Several studies have also highlighted that this technique allows for better post-operative pain management, with a positive impact on recovery.

Regarding postoperative pain, our results are similar to those described in the literature, with a peak observed on the first day, then a gradual improvement the next day. The use of multimodal analgesia has shown its effectiveness, as reported by other authors. Paracetamol, NSAIDs, co-analgesics such as nefopam, and sometimes the addition of morphine, make it possible to maintain satisfactory pain scores. The use of the TAP block in our study is also in line with a trend already studied, with promising results on post-operative comfort.

From a nutritional point of view, our study aligns with those that have demonstrated the interest of early refeeding after caesarean section. Resuming drinks in the early hours and a semi-liquid diet in the same day was well tolerated by patients, as confirmed by several studies. This strategy helps to improve recovery, while reducing the length of hospitalization.

We also found that rapid removal of the urinary catheter – on average less than 3 hours after the operation – reduced the risk of discomfort, infection, or retention. These results are in line with those of other studies that have shown the advantage of not unnecessarily prolonging the urinary catheter after caesarean section, in particular in a structured ERAS approach.

Early mobilization also showed a positive impact in our series. Patients in the ERAS group were able to get up earlier, which is in line with other studies highlighting the importance of limiting prolonged bedridden rest to reduce postoperative complications. This rapid mobilization was made possible by well-controlled analgesia and organization in the delivery room.

Finally, regarding breastfeeding, more than 90% of the women in our study were able to start breastfeeding early. This figure is consistent with the work that has shown that post-operative rehabilitation, when properly conducted, promotes the initiation of breastfeeding in the hours following childbirth. These results underline the overall positive impact of a well-structured ERAS approach, both on maternal comfort and on the immediate obstetric follow-up.

Conclusion:

Early rehabilitation after caesarean section aims to improve patients' recovery by promoting rapid independence, good pain management and early resumption of normal functions. In our study, the implementation of an ERAS protocol led to positive results in several areas: reduced pain, reduced opioid use, faster return home, and improved overall patient experience. Despite the benefits observed, the success of this approach depends on good coordination between teams and organizational adjustments adapted to the obstetrical context.