*Original Article*

# Cord Traction Versus Manual Removal for Placental Delivery during Cesarean Section

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***Background***: Cesarean section is the most common major surgery performed on pregnant women around the world. It is necessary to apply the practical skills training and current knowledge, especially in the procedure that would need to help keep mothers alive and the fetus safe.

***Objective***: To study the efficacy of the umbilical cord traction versus manual removal for placenta delivery in the third stage of labor during the cesarean section.

***Materials and Methods***: The present study was a retrospective comparative study conducted in Srisangwornsukhothai Hospital between January 2017 and January 2020. The purposive sample size was calculated by using a power of 80%, with a significant level of 5%. One hundred twenty pregnant women were divided into two groups, sixty pregnant women each, the cord traction as the first group and the manual removal as the second group for placental delivery during the cesarean section. The significance of the two groups were compared by using the independent t-test ($p<0.05$), 95% confidence interval (CI), and the Mann-Whitney U test.

***Results***: Several outcomes of the umbilical cord traction were better than the manual removal, such as decrease time of the operation and a statistically significant decrease in hemoglobin ($p<0.001$, 0.049, respectively). However, there was not a statistically significant decrease of blood loss, fever after surgery, or the length of stays ($p=0.839$, 0.056, 0.175, respectively). Only one outcome, the time of the third stage of labor, was slightly more than the manual removal group for placental delivery during the cesarean section with statistically significance ($p=0.003$).

***Conclusion***: The umbilical cord traction maneuver for the delivery of the placenta had more advantages than the manual removal maneuver. This technique should be a recommendation during the cesarean section.

***Keywords***: Cesarean section, Umbilical cord traction, Placental delivery

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Cesarean section is the most common major surgery performed on pregnant women around the world. It is necessary to apply the practical skills training and current knowledge, especially in this procedure, to help keeping mothers alive and the fetus safe, and take into account, the need for pregnancy and maternity planning in the next pregnancy[1-3].

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Postpartum hemorrhage (PPH) can produce the loss of more than 1,000 ml of blood after a cesarean section. Identification of the risk factors for bleeding before the operation is essential, such as prolonged second stage of labor, multiple deliveries, abnormal implantation or location of the placental site, fetal macrosomia, and history of PPH or the risk of uterine atony[3]. The third stage of labor is the placental delivery, and then, it may follow by massive PPH. It is preferable to continue placenta delivery after pulling the baby out of the uterus. Most obstetricians usually prefer manual removal placental delivery in the uterine cavity during the cesarean section. In spontaneous vaginal delivery, the obstetrician performs the cord traction for the placental delivery.

In 2012, the World Health Organization (WHO) recommended cord traction to remove the placenta in the cesarean section. The implementation consider that successful introduction of the evidence-based policies

related to the prevention and management of PPH into the national programs and health care services depend on well-planned and participatory consensus-driven processes of adaptation and implementation. The recommendation should be adapted into locally appropriate documents and tools that could meet the specific needs of each country and health service[4]. Many researches have supported the delivery of the placenta with cord traction at the cesarean section, which has more advantages than manual removal. The advantages are less endometritis, less blood loss, smaller decreased of hematocrit levels postoperatively, and shorter hospital stay. The research should provide information on the interval between the delivery of the infant and the placenta, change in lochia, blood splashing during placental removal, and uterine pain after the operation, as well as the effects of delayed cord clamping or spontaneous placental delivery[5,6]. There are very few studies to compare the technique for the delivery of the placenta during the cesarean section in Thailand. The author presented the efficacy of the umbilical cord traction versus manual removal for placenta delivery in the third stage of labor in the cesarean section.

## Materials and Methods

The Ethics Committee of the Sukhothai Provincial Health Office approved the present study (IRB 36/2020). It was a retrospective comparative study to assess the outcomes between two groups of pregnant women who were delivered by cesarean section. In the first group, the placenta was removed by cord traction maneuver while in the second group, the placenta was delivered by manual removal maneuver during the third stage of labor for placental delivery. The study compared the amount of blood loss, the interval of operation, the drop of hemoglobin (Hb) level, postoperative fever, and the length of the hospital stays of the pregnant women.

The population study was pregnant women who received a cesarean section in Srisangwornsukhothai Hospital between January 2017 and January 2020.

The inclusion criteria of each sample group were 1) the pregnant women with a history of attending antenatal care and gave birth in Srisangwornsukhothai Hospital, 2) delivered with cesarean section, and 3) able to communicate in Thai language.

The exclusion criteria were 1) the pregnant women with a low-lying placenta, placenta previa, or velamentous cord insertion of placenta, 2) prenatal bleeding, 3) abnormal blood clotting preoperative, and 4) incomplete medical records during delivery and postpartum.

The sample size was calculated by using a free online sample size calculator available at https://clincalc.com/stats/samplesize.aspx. The statistical analyses were using the independent t-test, the Mann-Whitney U test, a significant level of 5% and a power of 80%. Thirty-five pregnant women were required for each group by the calculation of the formula[7]. The samples were increased to sixty pregnant women of each group to compensate for missing data.

The third stage of labor for placental delivery in cesarean section for the first group followed these three steps[6]: 1) The obstetricians gently pulled the umbilical cord, slowly swirling like painting circle on the air, above the field of patient's abdominal incision wound. This process could be repeated until there was sign of placental delivery, then the placenta base was separated. It looked like a rotatory screw movement. 2) Another hand was gently pressed to control the uterine fundus. 3) Manual removal of the placenta was performed if the cord traction maneuver was not successful in placental delivery in 10 minutes or there was excessive bleeding[4].

The third stage of labor for placental delivery in cesarean section for the second group followed these two steps[3]: 1) The fingertips of one hand, with four fingers, were located approximately between the uterine wall and the placenta. 2) With sweep forward motion in this position, the placenta was peeled off its uterine attachment.

In both groups, if the uterine incision produced any vigorously bleeding sites, they would be quickly clamped with ring forceps. The placenta and membrane were carefully examined. Oxytocin 3 unit was given slowly intravenously, and ampicillin 2 grams was given for prophylactic antibiotics.

The authors reviewed the medical records about risk factors, data collection such as age, gravida, parity, abortion, and body mass index (BMI), operation record, visual estimation and disposable blood container for evaluation of blood loss[8], in-patient medical record, anesthesia record, laboratory results, vital signs, and pregnancy outcomes. The data were analyzed and discussed from clinical manifestation.

### Statistical analysis

Descriptive results of continuous variables were shown as mean, range, and standard deviation (SD), and categorical variables were shown as numbers and percentages. Statistical analysis was performed by using chi-square or Student's t-test appropriately,

**Table 1.** Demographic characteristics in both group of pregnant women

| Variable demographic data | Cord (n=60) n (%) | Manual (n=60) n (%) | Total (n=120) n (%) | p-value |
|---|---|---|---|---|
| Age (years); mean±SD | 29.130±6.176 | 28.480±6.198 | 28.800±6.170 | 0.345 |
| BMI (kg/m$^2$); mean±SD | 28.385±4.285 | 30.379±5.233 | 28.590±4.441 | 0.037 |
| Underlying disease | | | | 0.771 |
| No | 54 (90.00) | 53 (88.33) | 107 (89.17) | |
| DM | 2 (3.33) | 2 (3.33) | 4 (3.33) | |
| HT | 1 (1.67) | 3 (5.00) | 4 (3.33) | |
| Others | 3 (5.00) | 2 (3.33) | 5 (4.17) | |
| Gravidity | | | | 0.284 |
| 1 | 14 (23.33) | 24 (40.00) | 38 (31.67) | |
| 2 | 33 (55.00) | 22 (36.67) | 55 (45.83) | |
| ≥3 | 13 (21.67) | 14 (23.33) | 27 (22.50) | |
| Parity | | | | 0.118 |
| 0 | 18 (30.00) | 28 (46.67) | 46 (38.33) | |
| 1 | 32 (53.33) | 24 (40.00) | 56 (46.67) | |
| 2 | 10 (16.67) | 5 (8.33) | 15 (12.50) | |
| 3 | 0 (0.00) | 3 (5.00) | 3 (2.50) | |
| Abortion | | | | 0.415 |
| No | 50 (83.33) | 52 (86.67) | 102 (85.00) | |
| 1 | 9 (15.00) | 7 (11.67) | 16 (13.33) | |
| 2 | 1 (1.67) | 1 (1.67) | 2 (1.67) | |
| Type of anesthesia | | | | 0.973 |
| Spinal | 48 (80.00) | 46 (76.67) | 94 (78.33) | |
| GA | 12 (20.00) | 14 (23.33) | 26 (21.67) | |
| Indication of operation | | | | 0.876 |
| Previous cesarean section | 26 (43.33) | 23 (38.33) | 49 (40.83) | |
| CPD | 22 (36.67) | 25 (41.67) | 47 (39.17) | |
| Others | 12 (20.00) | 12 (20.00) | 24 (20.00) | |

SD=standard deviation; BMI=body mass index; DM=diabetes mellitus; HT=hypertension; GA=general anesthesia; CPD=cephalopelvic disproportion

independent t-test, Mann-Whitney U test, and a p-value of less than 0.05 was considered statistically significant. The data were use SPSS Statistics for Windows, version 16 (SPSS Inc., Chicago, IL, USA) with Windows 10.

## Results

The population of the present study was 120 pregnant women who delivered by cesarean section and were divided into two groups, 60 pregnant women in each group. In the first group, the placenta was removed by cord traction procedure. In the second group, the placenta was extracted by a manual removal procedure.

Table 1 shows the demographic characteristics in both groups of pregnant women, they were of similar average age (the first group 29.13±6.176, the second group 28.48±6.198, p=0.345). The average BMI for the first group was 28.385±4.285 and the second group was 30.379±5.233 (p=0.037) showing statistical significance. The history showed no underlying disease (89.17%), complicated of gestational diabetic mellitus (3.33%), and pregnancy-induced hypertension (3.33%) with no statistical significance. An average gravida was two (45.83%), and parity was one (46.67%) with no history of abortion (85%) and no statistical significance. The type of anesthesia was mostly spinal anesthesia

**Table 2.** Statistic analysis for several outcome measurements

| Type of outcomes | Cord traction (n=60) Mean±SD | Manual removal (n=60) Mean±SD | Mean difference (95% CI) | p-value* |
|---|---|---|---|---|
| 3rd stage of labor (minute) | 2.100±0.752 | 1.366±0.311 | 0.733 (0.525 to 0.941) | 0.003* |
| Interval of operation (minute) | 49.330±10.434 | 57.370±10.833 | 8.033 (4.179 to 11.887) | <0.001* |
| Estimated blood loss (g/dL) | 472.500±158.490 | 478.330±154.960 | –5.833 (–62.502 to 50.835) | 0.839 |
| Fever after operation | 1.170±0.376 | 1.320±0.469 | –0.150 (–0.304 to 0.004) | 0.056 |
| n (%) | 10 (16.670) | 19 (31.670) | | |
| Length of stays (g/dL) | 3.950±1.170 | 4.266±1.363 | –0.316 (–0.776 to 0.143) | 0.175 |

SD=standard deviation; CI=confidence interval

* Independent t-test, p<0.05

**Table 3.** Statistical analysis for hemoglobin drop measurement

| Type of outcome | Cord traction (n=60) | | Manual removal (n=60) | | p-value* |
|---|---|---|---|---|---|
| | Median | Interquartile range | Median | Interquartile range | |
| Hb drop (g/dL) | 0.500 | 0.40 | 0.650 | 0.51 | 0.049* |

Hb=hemoglobin

* Mann-Whitney U, p<0.05

(78.33%) with no difference between the groups. The indication of the cesarean section was mostly from the previous cesarean section (40.83%) and cephalopelvic disproportion (39.17%) of all pregnant women.

Table 2 demonstrates the outcomes, which were compared in the present study.

The time of third stage of labor for the placental delivery was for the first group (2.100±0.752) more than the second group (1.366±0.311) with statistical significance (95% confidence interval [CI] 0.525 to 0.941, p=0.003). However, the time of operation for cesarean section for the first group (49.330±10.434) was less than for the second group (57.370±10.833), with statistical significance (95% CI 4.179 to 11.887, p<0.001). It might be due to the obstetrician who could pull the umbilical cord from the uterine cavity and continue suturing to close the uterine incision instantly because of the significant contraction of the uterus, and there was less bloodstain on the surgeon's hand than in the manual removal placenta. The author applied an increase accuracy of visual estimation of blood loss from the education program to measure volumes of blood to the following surgical materials, abdominal swabs, rolled gauzes, surgical sponges, half sheet, and disposable blood containers[8]. It was found that the first group (472.500±158.490) lost blood less than the second group (478.330±154.960), but not statistically significant (95% CI –62.502 to 50.835, p=0.839). The Hb of the first group (median 0.500, interquartile range [IQR] 0.40) decreased less than of the second group (median 0.650, IQR 0.51), with statistical significance (p=0.049) (Table 3). The implementation of the program improved intraoperative blood loss estimation accuracy. Previously, there might have been underestimation, optimal estimation, or overestimation. The limitations of the present study might be challenges for qualitative research in the future.

For postoperative fever, the first group (16.67%) had less fever than the second group (31.67%), but this was not statistically significant (95% CI –0.304 to 0.004, p=0.056). The length of hospital stays in the first group (3.950±1.170) was less than the second group (4.266±1.363), with no statistical significance (95% CI –0.776 to 0.143, p=0.175). Fortunately, no subject was changed from the first group to the second group, which might be found in the case of abnormal placenta implantation.

## Discussion

Cesarean section is the most common major surgery performed on pregnant women and tends to increase in the future. For the cesarean section to be safe, both mothers and infants are the goal of management[1-3]. The doctors and effective teamwork should update their knowledge and surgical skills for the cesarean section. The development of expertise and cesarean skills are choosing appropriate

anesthesia, type of an abdominal incision, placental delivery technique, method of uterine closure, and the selection of various medications during and after surgery. Therefore, the management is to have a good contractility of the uterus to prevent PPH, reduce infection, and maintain a good fertility situation. Thailand is a country with many variations in size and proficiency in hospital setting, such as militaries, universities, centers, general, and community hospitals. In the present study, a retrospective comparison research was done in a low resource general hospital. The author presented the study comparing the efficacy of the umbilical cord traction versus manual removal for placenta delivery in the third stage of labor during the cesarean section. The placental delivery technique's outcomes might be chosen to improve the cesarean operative skills. The present research demonstrated the decrease of time for surgery and less decline of Hb in the cord traction technique than the manual removal technique with statistical significance. Its proper evidence supported better outcomes to the amount of blood loss, a fever after surgery, and the length of stays in the hospital with no statistical significance. The results of the present study were similar to the other previous reports. Morales et al[6] concluded that spontaneous delivery of the placenta reduces significant blood loss without increasing operating time.

Anorlu et al[5] suggested that the delivery of the placenta with cord traction at the cesarean section had more advantages than manual removal. These were less endometritis, less blood loss, a slighter decrease in hematocrit levels postoperatively, and shorter duration of hospital stay.

Althabe et al[9] suggested that the control cord traction might reduce postpartum blood loss. The present findings supported conducting a large trial to determine whether it could prevent PPH.

Ajay and Suman[10] concluded that spontaneous delivery of the placenta as compared to manual expression reduced the blood loss significantly without increasing the operating time. After the placental delivery, blood loss at the cesarean section was significantly less after spontaneous expulsion of the placenta compared to the manual expression of the placenta.

Pokharel[11] concluded that spontaneous delivery of the placenta as compared to manual expression significantly reduced the blood loss without increasing the operating time. After the placental delivery at the cesarean section, blood loss was significantly less after the spontaneous expulsion of the placenta compared to manual removal.

Yadav et al[12] reported that the control cord traction was found to be a safer method concerning intraoperative blood loss, which was significantly lower than the manual removal of the placenta. There was considerably less endometritis and postoperative decrease in Hb.

Hofmeyr et al[13] presented that the control cord traction had the advantage of reducing the risk of manual removal of the placenta in some circumstances, and the evidence suggested that it could be routinely offered during the third stage of labor, provided the birth attendant had the necessary skills.

Only one outcome showed the manual removal technique better than the cord traction, and it was the time of the third stage of labor for placental delivery. The average of the placental delivery time was faster and statistically significant. Therefore, it was reasonable that the obstetricians chose the use the manual removal procedure. Altraigey et al[14] presented their study of placental delivery techniques, and they concluded that there were no clinically significant differences in terms of the considered intraoperative and postoperative outcomes; hence, the practice of placental delivery could depend on the obstetrician's discretion and intraoperative scenario.

The limitation of the present study is due to the retrospective comparative design of the cesarean section. It might be interesting to do a qualitative research and prospective randomized controlled trial in the future. The researcher expected that the umbilical cord traction maneuver was chosen for treatment of the third stage of labor, especially recommendation for placental delivery. The present research demonstrated that the cord traction technique was more useful for improving cesarean section skills.

## Conclusion

The umbilical cord traction maneuver for the delivery of the placenta had more advantages than the manual removal maneuver. This technique should be recommended in the cesarean section.

## What is already known on this topic?

The interest in this research was coaching practical skills, especially the cesarean section. It was essential to assess the effectiveness of the teamwork during operation.

## What this study adds?

Uterine incision was a low transverse. The entire

case of the operation used various medications. The medications used were oxytocin three units intravenously after the umbilical cord was clamped and the prophylactic antibiotic was ampicillin.


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## Conflicts of interest

The author declares no conflict of interest.

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