

# Non-closure of peritoneal surfaces at caesarean section — a systematic review



**Rob Ferreira and Mediclinic hospitals, Nelspruit**

**Anthony Akinloye Bamigboye, BSc (Hons), MB ChB, MMed (O&G), FCOG (SA)**

**East London Hospital Complex/Effective Care Research Unit, University of the Witwatersrand, Johannesburg**

**G Justus Hofmeyr, MB ChB, MRCOG**

**Background.** Caesarean section (CS) is a very common surgical procedure worldwide. Suturing the peritoneal layers at CS may or may not confer benefit, hence the need to evaluate whether this step should be omitted or not.

**Objectives.** To assess the effects of non-closure as an alternative to closure of the peritoneum at CS on intra-operative, immediate and later postoperative, and long-term outcomes.

**Search strategy.** We searched the Cochrane Pregnancy and Childbirth Group Trials Register (November 2002) and the Cochrane Central Controlled Trials Register (October 2003).

**Selection criteria.** Randomised controlled trials that compared leaving the visceral and/or parietal peritoneum unsutured at CS with suturing the peritoneum, in women undergoing elective or emergency CS.

**Data collection and analysis.** Trial quality was assessed and data were extracted by two reviewers.

**Main results.** Nine trials involving 1 811 women were included and analysed. The methodological quality of the trials was variable. Non-closure of the peritoneum reduced operating time when both layers or one layer was not sutured. For both layers, the operating time was reduced by 7.33 minutes (95% confidence interval (CI): -8.43 - -6.24). There was significantly less postoperative fever and reduced postoperative stay in hospital for non-closure of the visceral peritoneum and non-closure of both layers. There were no other statistically significant differences. The trend for analgesia requirement and wound infection tended to favour non-closure, while endometritis results were variable. Long-term follow-up in 1 trial showed no significant differences. The power of the latter study to show differences was low.

**Conclusions.** There was improved short-term postoperative outcome if the peritoneum was not closed. Long-term studies following CS are limited, but data from other surgical procedures are reassuring. At present there is no evidence to justify the time taken and cost of peritoneal closure.

*S Afr Med J* 2005; **95**: 123-126.

Caesarean section (CS) is one of the most frequently performed surgical procedures worldwide, accounting for anything up to 70% of deliveries, depending on the facility assessed and the country involved. In general, rates around the world are from about 5% to over 20% of all deliveries.<sup>1</sup> The Saving Babies Report for South Africa showed a rate of 15% in public hospitals.<sup>2</sup> There were 660 000 deliveries in South African public institutions, excluding community health centres and private hospital deliveries, over a 12-month period.<sup>3</sup> Based on this figure it can be estimated that

a total of about 99 000 CSs would have been performed in public institutions. The rate in private hospitals was estimated to be 57%.<sup>4</sup>

There are many possible ways of performing a CS and operative techniques used vary considerably. The techniques used depend on many factors including the clinical situation and the preference of the operator.

Closure of the peritoneum at laparotomy has been a part of 'standard' surgical practice. Reasons cited for closure of the

peritoneum include restoring anatomy and reapproximating tissues, reducing infection by re-establishing an anatomical barrier, reducing wound dehiscence, reducing haemorrhage, minimising adhesions and maintaining standard practice.<sup>5,6</sup> *In vivo* experiments on dogs<sup>7</sup> and rats<sup>8,9</sup> have shown no difference in wound strength whether the peritoneum is closed or not, and have suggested that peritoneal adhesions may be more extensive when the peritoneum is closed, presumably as a result of the foreign body reaction from the suture material.

In general surgery randomised controlled trials of peritoneal closure or non-closure with vertical abdominal incisions have shown no significant short-term differences in postoperative complications or pain scores.<sup>10-12</sup> In operative gynaecology, controlled trials of peritoneal non-closure in vaginal hysterectomy,<sup>13</sup> abdominal and radical hysterectomy<sup>14</sup> and lymphadenectomy for ovarian cancer<sup>15</sup> have demonstrated no difference, or an improvement in short-term postoperative morbidity if the peritoneum is not closed. In the latter study,<sup>15</sup> peritoneal non-closure significantly reduced adhesion formation.

The step of either suturing or not suturing the peritoneal surfaces is one of several surgical techniques of CS addressed in Cochrane reviews. If this step could be omitted without adverse effect or with benefit to the individual patient, and with a reduction in operating time and suture material, this could lead to a meaningful cost saving given the large numbers of CSs performed worldwide.

## Objectives

The aim of the study was to determine whether dispensing with closure of the peritoneum at CS affects the duration of operation, the postoperative course and long-term outcomes.

## Criteria for considering studies for this review

### Types of studies

All randomised controlled trials that compared leaving the peritoneum unsutured at CS with the conventional approach of suturing the peritoneum were included in the study. Quasi-random allocation trials (e.g. based on hospital number) were included in the analysis.

### Types of participants

Participants were women undergoing CS.

### Types of interventions

The peritoneum, either visceral or parietal or both visceral and parietal, was left unsutured in the experimental group, and was sutured, usually with a continuous suture, in the control group.

## Types of outcome measures

Wound infection, wound dehiscence, analgesic requirement, postoperative fever, endometritis, operating time, duration of hospital stay and adhesions at follow-up operation were used as outcome measures.

## Search strategy for identification of studies

The Cochrane Pregnancy and Childbirth Group Trials Register was searched in November 2002. There were no language exclusions. The trials register is maintained by the trials search co-ordinator and contains trials identified from quarterly searches of the Cochrane Central Register of Controlled Trials, monthly searches of MEDLINE, hand searches of 30 journals and the proceedings of major conferences and also weekly current awareness searches of a further 37 journals. The Cochrane Central Controlled Trials Register was searched in October 2003.

## Methods

Data on trial methodology and results were abstracted from published trials by the reviewers. As masking is difficult for operative procedures, assessment of trial quality was limited to allocation concealment, which was classified as 'adequate', 'unclear', 'inadequate' and 'not used.' Sensitivity analysis was performed by excluding trials with inadequate allocation concealment. Assessment of the quality of each study was performed by the reviewers, and studies were excluded when appropriate before analysis of results or incorporation into the meta-analysis to minimise chances of selection bias. Authors of published abstracts or unpublished data were contacted for further details of the study methodology and results so that their data could be included where appropriate.

The quality of the trials was variable. In 5 of the 9 studies included, the method of allocation at randomisation was judged to be adequate. A quasi-random method of allocation was used in 3 trials,<sup>16-18</sup> while the method of allocation was unclear in 1 trial.<sup>19</sup>

All extracted data were entered into RevMan Review Manager software (RevMan 2000, Oxford, UK) for statistical analysis.

## Results

Nine trials involving 1 811 women were included and analysed.

### Non-closure of both the visceral and peritoneum compared with suturing of both (Figs 1 - 3)

A total of 6 studies with 974 participants were included.<sup>16,19-23</sup> A reduction in operative time was noted in women who had both peritoneal surfaces unsutured (weighted mean

Review: Closure versus non-closure of the peritoneum at caesarean section  
 Comparison: 01 Non-closure of both parietal and visceral peritoneum versus closure of both peritoneal layers  
 Outcome: 01 operating time (minutes)

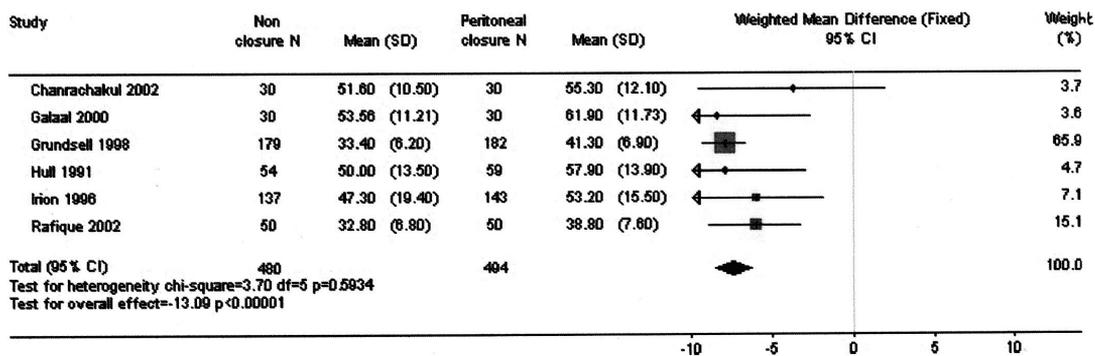


Fig. 1. Operating time.

Review: Closure versus non-closure of the peritoneum at caesarean section  
 Comparison: 01 Non-closure of both parietal and visceral peritoneum versus closure of both peritoneal layers  
 Outcome: 03 postoperative fever

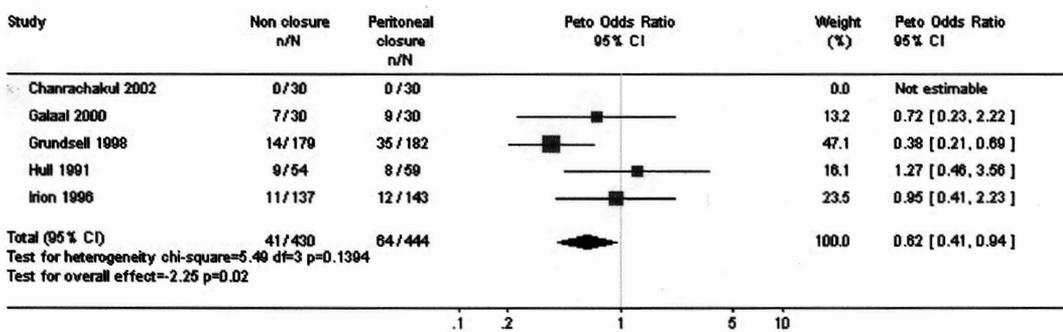


Fig. 2. Postoperative fever.

Review: Closure versus non-closure of the peritoneum at caesarean section  
 Comparison: 01 Non-closure of both parietal and visceral peritoneum versus closure of both peritoneal layers  
 Outcome: 05 postoperative days in hospital

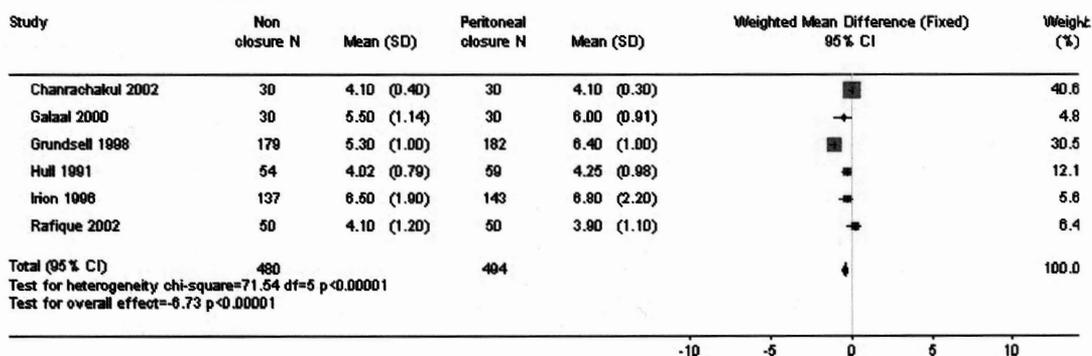


Fig. 3. Postoperative days in hospital.

difference (WMD) -7.33 minutes, 95% confidence interval (CI): -8.43 - -6.24). In 5 studies with 874 women, there was less postoperative fever in the non-closure group (odds ratio (OR) 0.62, 95% CI: 0.41 - 0.94). Postoperative hospital stay was reduced in the non-closure group (WMD -0.39 days, 95% CI: -0.51 - -0.28). Data could be used from only 2 or 3 trials for wound infection, endometritis and analgesic doses required, and there were no statistical significant differences. Analgesia data from Rafique *et al.*<sup>23</sup> could not be included as the method used was different from that in other studies. In the latter trial, patient-controlled analgesia was used significantly less in the non-closure group (morphine 0.64 (standard deviation (SD) 0.33) versus 0.82

(0.49) mg/kg/24 hours). Sensitivity analysis, excluding the one quasirandomised trial<sup>16</sup> (Hull 1991), did not materially alter any of the findings.

In a long-term follow-up of 1 study<sup>22</sup> (Irion 1996), 144 of 280 women responded to a questionnaire at 7 years. There were no significant differences in level of fertility, abdominal pain, urinary symptoms, or adhesions and subsequent surgery. The power of the study to show differences was low.

One study<sup>18</sup> (Nagele 1996) involving 549 women showed reduction in operating time (WMD -6.30 minutes, 95% CI: -9.20 - -3.40), postoperative fever relative risk (RR) 0.66,

95% CI: 0.46 - 0.95), and number of postoperative days in hospital (WMD -0.70, 95% CI: -0.98 - -0.42) in the non-closure group. There were no significant differences in endometritis or wound infection. As 1 study in this section was a quasi-randomised trial, the results should be interpreted with caution.

## Non-closure of the visceral peritoneum only compared with suturing both the parietal and visceral peritoneum

Two studies<sup>17,24</sup> involving 288 women were identified. The latter was a quasi-randomised trial. There were no significant differences in endometritis, fever, wound infection or hospital stay, but the operative time was reduced (WMD -5.10 minutes, 95% CI: -8.71 - -1.49).

## Discussion

Although the methodological quality of trials was variable, in general the results were consistent between the trials of better and poorer quality. There is evidence of benefit in the immediate postoperative outcomes and duration of surgery for non-closure of the peritoneum at CS compared with routine closure. Shorter duration of the operation may have clinical benefits in terms of reduced risk of infection and postoperative complications such as paralytic ileus (owing to shorter exposure of the peritoneal cavity). Some women undergoing regional analgesia experience discomfort and anxiety during surgery. Reducing the operative time by several minutes may be beneficial for these reasons.

The difference in morbidity was small, but as CS is so commonly performed, any small improvement in morbidity may have important implications in practice. While cost was not addressed directly in these trials, the use of less suture material would reduce cost, which may be of particular importance in resource-poor countries. The cost of one vicryl 2,0 suture (Ethicon Visyn Vs 184) is approximately R276 in the private health sector and much cheaper in public institutions at about R8.70 per suture (Mpumalanga Department of Health — personal communication, medical store, Rob Ferreira Hospital). With a CS estimate of 99 000 per annum in South African public institutions, a saving of about R861 000 can be made without any known short-term sequelae. The figure will be proportionately much higher in the private health sector.

The data in this review on long-term benefits or hazards of leaving the peritoneum unsutured are inadequate to inform practice, although data from other surgical procedures and animal studies suggest long-term benefit from peritoneal non-closure, particularly regarding adhesion formation. More data on the long-term sequelae of leaving the peritoneal surfaces sutured or non-sutured, specifically at CS, would be useful.

## Conclusions

### Implications for practice

Available evidence suggests that leaving the peritoneum unsutured is not likely to be hazardous in the short term, and may be of benefit. The limited evidence on long-term outcomes is reassuring. At present there is no evidence to justify the increased time taken and cost of peritoneal closure, except in the context of randomised trials to evaluate long-term outcomes.

### Implications for research

Further research on the long-term benefits or complications of non-closure of the peritoneum at CS is needed, and new reviews are expected to be published as more studies become available. A multicentre trial of techniques of CS is currently in progress (Caesar Study — Perinatal Epidemiology Unit, Oxford, UK).

- Lomas J, Enkin M. Variations in operative delivery rates. In: Chalmers I, Enkin M, Keirse MJNC, eds. *Effective Care in Pregnancy and Childbirth*. Oxford: Oxford University Press, 1989.
- Pattinson RC. Saving Babies: A Perinatal Care Survey of South Africa 2000. Medical Research Council and Department of Health, 2001.
- Moodley J. Saving mothers: 1999 - 2001. *S Afr Med J* 2003; **93**: 364-366.
- Tshibangu KC, de Jongh MA, de Villiers DJ, Du Toit JJ, Shah SMH. Incidence and outcome of caesarean section in the private sector — 3 year experience at Pretoria Gynaecological Hospital. *S Afr Med J* 2002; **92**: 956-959.
- Duffy DM, diZerega GS. Is peritoneal closure necessary? *Obstet Gynecol Surv* 1994; **49**: 817-822.
- Bamigboye AA, Buchman E, Hofmeyr GJ. Closure of peritoneum at laparotomy: a survey of gynecological practice. *S Afr Med J* 1999; **89**: 332-335.
- Parulkar BG, Supe AN, Vora IM, Mathur SK. Effect of experimental non closure of peritoneum on development of suture line adhesions and wound strength in dogs. *Indian J Gastroenterol* 1998; **5**: 251-253.
- Kapur ML, Daneshwar A, Chopra P. Evaluation of peritoneal closure at laparotomy. *Am J Surg* 1979; **137**: 650-652.
- Kyzer S, Bayer I, Turani H, Chaimoff C. The influence of peritoneal closure on the formation of intraperitoneal adhesions: an experimental study. *Int J Tissue React* 1986; **8**: 355-359.
- Ellis H, Heddle R. Does the peritoneum need to be closed at laparotomy? *Br J Surg* 1977; **64**: 733-736.
- Gilbert JM, Ellis H, Poweraker S. Peritoneal closure after lateral paramedian incision. *Br J Surg* 1987; **74**: 113-115.
- Hugh TB, Nankivell C, Meagher AP. Is closure of the peritoneal layer necessary in the repair of midline surgical abdominal wounds? *World J Surg* 1990; **14**: 231-233.
- Lipscomb GH, Ling FW, Stovall TG. Peritoneal closure at vaginal hysterectomy: a reassessment. *Obstet Gynecol* 1996; **87**: 40-43.
- Than GN, Arany AA, Schunk E, Vizer M, Krommer KF. Closure and non closure after abdominal hysterectomies and Wertheim-Meigs radical abdominal hysterectomies. *Acta Chir Hung* 1994; **34**: 79-86.
- Kananali S, Erthen O, Kucikozkan T. Pelvic and peritoneal closure and non closure at lymphadenectomy in ovarian cancer: effects on morbidity and adhesion formation. *Eur J Surg Oncol* 1996; **22**: 282-285.
- Hull DB, Varner MW. A randomized study of closure of the peritoneum at cesarean delivery. *Obstet Gynecol* 1991; **77**: 818-821.
- Pietrantoni M, Parsons MT, O'Brien WF, Collins E, Knuppel RA, Spellacy WN. Peritoneal closure or non-closure at cesarean. *Obstet Gynecol* 1991; **77**: 293-296.
- Nagele F, Karas H, Spitzer D, et al. Closure or non closure of the visceral peritoneum at caesarean delivery. *Am J Obstet Gynecol* 1996; **174**: 1366-1370.
- Grundsell HS, Rizk DEE, Kumar MR. Randomized study of non-closure of peritoneum in lower segment cesarean section. *Acta Obstet Gynecol Scand* 1998; **77**: 110-115.
- Chanrachakul B, Hamanontri S, Herabutya T. A randomized comparison of postcesarean section pain between closure and non closure of peritoneum. *Eur J Obstet Gynecol Reprod Biol* 2002; **101**: 31-35.
- Galaal KA, Krolikowski A. A randomized controlled study of peritoneal closure at cesarean section. *Saudi Medical Journal* 2000; **21**: 759-761.
- Irion O, Luzuy F, Beguin F. Non closure of the visceral and parietal peritoneum at cesarean section: a randomised controlled trial. *Br J Obstet Gynaecol* 1996; **103**: 690-694.
- Rafique Z, Shibli KU, Russell LF, Lindow SW. A randomised controlled trial of the closure or non-closure of peritoneum at caesarean section: effect on post-operative pain. *Br J Obstet Gynaecol* 2002; **109**: 694-698.
- Hojberg K, Aagaard J, Laursen H, Diab L, Secher NJ. Closure versus non-closure of peritoneum at cesarean section — evaluation of pain. *Acta Obstet Gynecol Scand* 1998; **77**: 741-745.