Techniques for the interruption of tubal patency for female sterilisation (Review)

Nardin JM, Kulier R, Boulvain M

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ABSTRACT

Background
Female sterilization is the most popular contraceptive method worldwide. Several techniques are described in the literature, however only few of them are commonly used and properly evaluated.

Objectives
To compare the different tubal occlusion techniques in terms of major and minor morbidity, failure rates (pregnancies), technical failures and difficulties and women's and surgeons' views.

Search strategy
The Cochrane Controlled Trials Register has been searched. A search of the reference lists of identified trials was performed. An additional MEDLINE search was done using an Internet search service Pub Med.

Selection criteria
All randomized controlled trials comparing different techniques for tubal sterilization, regardless of the way of entry in the abdominal cavity or the method of anesthesia.

Data collection and analysis
Trials under consideration were evaluated for methodological quality and appropriateness for inclusion. Nine relevant studies were included and the results were stratified in five groups: tubal ring versus clip, modified Pomeroy versus electrocoagulation, tubal ring versus electrocoagulation, modified Pomeroy versus Filshie clip and Hulka versus Filshie clip. Results are reported as odds ratio for dichotomous outcomes and weighted mean differences for continuous outcomes.

Main results
Tubal ring versus clip: Minor morbidity was higher in the ring group (Peto OR 2.15; 95% CI 1.22, 3.78). Technical difficulties were found less frequent in the clip group (Peto OR 3.87; 95% CI 1.90, 7.89). There was no difference in failure rates between the two groups (Peto OR 0.70; 95% CI 0.28, 1.76).
Pomeroy versus electrocoagulation: Women undergoing modified Pomeroy technique had higher major morbidity than with electrocoagulation technique (Peto OR 2.87; 95% CI 1.13, 7.25). Postoperative pain was more frequent in the Pomeroy group (Peto OR 3.85; 95% CI 2.91, 5.10).
Tubal ring versus electrocoagulation: Post operative pain was more frequently reported in the tubal ring group. No pregnancies were reported.
Pomeroy versus Filshie clip: In the trial comparing the two interventions only one pregnancy was reported in the Pomeroy group after follow-up for 24 months.
No differences were found when comparing Hulka versus Filshie clip in the only study that compared these two devices (Toplis 1988).

Authors' conclusions
Electrocoagulation was associated with less morbidity when compared with tubal ring and other methods. However the risk of burns to the small bowel might be a serious criticism of the approach. The small sample size and the relative short period of follow-up in

these studies limited the power to show clinical or statistical differences for rare outcomes such as failure rates. Aspects such as training, costs and maintenance of the equipment may be important factors in deciding which method to choose.

PLAIN LANGUAGE SUMMARY

Effective techniques for tubal sterilisation (blocking the fallopian tubes) include cutting, tying, clips, rings and electric current, but their comparative effectiveness is not clear

Tubal sterilisation prevents pregnancy by stopping the woman's unfertilised egg (ovum) passing through the fallopian tubes where it can be fertilised by sperm. Techniques to close the tubes include cutting and tying, blocking mechanically by using clips or rings, and the use of an electric current to coagulate (form a hard mass) in the tubes. The review of trials found that all techniques are effective in preventing pregnancy, with few adverse effects. There is too little evidence to which technique is most effective. Pregnancy after tubal sterilisation is less likely if an experienced practitioner has performed the procedure.

BACKGROUND

Female sterilization, which is also called tubal ligation or tubal occlusion is the most widely used contraceptive method in the world today (WHO 1994). From 1950 until 1982 the number of couples using voluntary sterilization increased thirty fold. This explosive increase may be attributed partly to surgical innovations that changed sterilization from a major operation to a safe and effective outpatient procedure (Bhiwandiwala 1980). Over a hundred million women of childbearing age have been sterilised and it is estimated that more than 100 million women in the developing world alone will seek sterilization in the next 20 years (WHO 1992).

Pomeroy in the 1930s made tubal sterilization well known. But at this time it was still a major procedure including all the surgical and anesthetic complications (Bhiwandiwala 1980).

Female sterilization prevents pregnancy by occluding or disrupting tubal patency. Several different techniques have been developed. Tubes can be ligated or a section can be removed. They can be blocked mechanically by using clips or rings or coagulated and closed by using electrical current. Interventions such as hysterectomy or ovariectomy also lead to female sterility but are not considered in this review, as these operations are usually performed primarily for other medical reasons.

Ligation and division methods involve tying of each fallopian tube with suture material and cutting it and, for some techniques, removing the section of the tube (Pomeroy, Parkland, Uchida, Irving technique). Other ligation methods include fimbriectomy or salpingectomy (Kroener, Madlener, Aldrich technique). Using Pomeroy's technique, a free tie is placed around a loop of the fallopian tube which is then excised. This is perhaps the most widely used excisional technique. All these methods are mainly used with the minilaparotomy approach.

Electrical methods (electrocoagulation, diathermy) are used to block the fallopian tubes. Previously, the standard laparoscopic technique for tubal occlusion has been electrocoagulation with unipolar forceps. The risk of burns to the bowel and other organs has lead to the development of bipolar electrocoagulation forceps (Kessel 1976).

Mechanical methods involve placing a band or ring, made of silicone or rubber (Yoon ring), around each tube and seal them as well as clips (e.g. Filshie, Hulka). These devices are seen to be safer for the woman by some authors (Kessel 1976, Destefano 1983), and might increase the chance of reversibility among the significant percentage of women who experienced regret (Hillis 1999). Only a small portion of the tube is damaged using these techniques, while twenty to 50 percent of the tube (3-6 cm) is destroyed by unipolar coagulation (Koetsawang 1990, Kaplan 1990, Lipscomb 1992, Chi 1994). The major disadvantage of both clips and rings is the greater postoperative pain associated with the devices when compared with electrocoagulation (Lipscomb 1992, Pelland 1977). Topical anesthetic agents applied intraoperatively to fallopian tubes during laparoscopic ligation have been shown to reduce postoperative pain (Baram 1990, Ezeh 1995, Thompson 1987, Pelland 1976).

Methods to interrupt tubal patency by damaging the proximal end of the tube were developed. These include application of quinacrine into the uterine cavity (Suhadi 1998), leading to chemical irritation and scarring of the tubes or insertion of removable plugs into the fallopian tubes by using a hysteroscope. Another chemical agent called methylcyanoacrylate has been studied as a transcervical applicable method (Neuwirth 1983). However, these methods are still under investigation.

Pregnancy following tubal sterilization may be the result of conception occurring before the procedure (Gupta 1980), incomplete occlusion or formation of fistulas.

Sterilization failures have been reported with all methods of tubal sterilization up to several years after the procedure. Failure occurs in less than or around 1% in the first year after surgery (Bhiwandiwala 1980, Peterson 1996, Chi 1980).

Different ways to gain access to the tubes were assessed in another review (Kulier 2000).
This review considers the different techniques for tubal interruption, regardless of the surgical method of entering the abdominal cavity, and evaluates them for their safety and effectiveness.

OBJECTIVES

To compare the different tubal occlusion techniques in terms of major and minor morbidity, failure rates (pregnancies), technical failures and difficulties and women's and surgeons' views.

CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

Types of studies

All randomized controlled trials comparing different occlusion techniques for tubal sterilization were considered. Trial characteristics were assessed and trials were included if they fulfilled the following criteria: random allocation to intervention groups; reasonable measures to ensure allocation concealment, violations of allocated management not sufficient to materially affect outcomes.

Types of participants

Women requesting tubal sterilization as an interval, postabortion or postpartum procedure.

Types of intervention

In this review the different techniques used to interrupt tubal patency were compared.
Definitions:
Partial salpingectomy: the fallopian tubes are cut and tied with suture material. Pomeroy technique is a version of partial salpingectomy, which involves tying a small loop of the tube and cutting off the top segment of the tube.
Tubal clips: clips block the fallopian tubes by clamping and cutting off the blood supply to a portion of the tubes, causing a small amount of scarring and fibrosis, which prevents passage of ovum or sperm and therefore fertilisation.
Tubal silicone rings: rings block the tubes mechanically. A small loop of the fallopian tube is pulled through the stretched ring; by releasing the ring it stops the blood supply to the loop. Scarring as a result prevents transport of ovum or sperm and therefore fertilisation.
Electrocoagulation: electric current is used to burn or coagulate a small part of each fallopian tube. Unipolar coagulation: the current passes through the forceps applied on the tubes and leaves a woman´ s body through an electrode usually placed under her thigh. Bipolar coagulation: the current enters and leaves the body through two ends of the forceps.
Other interventions for tubal sterilization such as instillation of chemical agents or insertion of removable plugs into the fallopian tubes have also been considered in this review.
Postpartum sterilization: sterilization performed during cesarean section or within 41 days after delivery, although it is usually performed during the first week postpartum.
Postabortion sterilization: when it is performed immediately after termination of pregnancy.
Interval sterilization: refers to sterilization performed at least 6 weeks after delivery.

Types of outcome measures

Primary outcomes:
Failure rate (yearly incidence of unintended pregnancy) including extrauterine pregnancy, operative mortality and major and minor morbidity (procedure related intestinal, vascular or bladder injuries, injury to other pelvic organ, blood transfusion, rehospitalization), failure of technical approach (e.g. clip converted to partial salpingectomy).

Other outcomes included:
Operative time
Changes in menstrual bleeding pattern
Postoperative pain: scores or use of analgesics
Postoperative complications: wound infection, reoperation, urinary tract infection, pelvic inflammatory disease
Length of hospital stay
Difficulty of procedure
Persistent pain
Women's satisfaction
Surgeons' satisfaction

Definitions:
Postoperative pain: defined whenever possible as localized physical suffering related to the tubal occlusion technique.
Postoperative complication: any disease or condition developed as a direct consequence of the procedure
Changes in menstrual pattern: any changes of the previous frequency or quantity of the women menses.
Major morbidity: any morbidity occurring as a result of the intervention that lead to an additional intervention (e.g. additional surgical procedure, blood transfusion) or to re-hospitalization.
Minor morbidity: any morbidity occurring as a result of the intervention and which does not lead to major additional interventions.
Technical failure or failure of technical approach: failure to apply the intended method with the consequent need to switch to another technique.
Technical difficulties: any difficulty in applying the selected method and which does not lead to change to another procedure.

SEARCH METHODS FOR IDENTIFICATION OF STUDIES

See: methods used in reviews.

Randomized controlled trials (RCTs) were identified by using the search strategy of the Cochrane Collaboration. See Review Group's details for more information. The Cochrane Controlled Trials Register and Medline were searched. An electronic search strategy was developed, including the following terms: (tubal OR female OR contracep*) AND (sterilis* OR steriliz* OR laparo* OR culdoscopy OR colpotomy OR Filshie OR Hulka OR Yoon OR Pomeroy OR Irving OR Parkland OR (Rocket and Clips) OR (tubal and ring) OR (silastic and ring) OR (Quinacrine AND tubal) OR (chemical AND instillation AND tubal)). Reference lists of identified trials were searched for possible trials.

METHODS OF THE REVIEW

The selection of trials for inclusion in the review was performed by two of the reviewers (RK, JMN) after employing the search strategy described previously. Data extraction was conducted independently by two co-reviewers (RK, JMN). A form was designed to facilitate the process of data extraction. In case of discrepancies between reviewers in either the decision of inclusion/ exclusion of studies or in data extraction, this was resolved by consensus. Whenever possible, the analysis was conducted on an 'intention to treat' basis. Attempts were made to obtain additional information if necessary.

The following additional baseline data were extracted:
Details on surgical methods: classification of surgical procedure, type of anaesthesia, setting (country, level of the health care institution, year)

Number of randomized women
Exclusion after randomization and losses to follow-up
Method of randomization and concealment of allocation

A quality score for concealment of allocation was assigned to each trial, using the following criteria:
(A) adequate concealment of allocation
(B) unclear whether concealment of allocation is adequate
(C) inadequate concealment of allocation, quasi-randomization

Only studies scoring A or B were included in the review.

For withdrawals, studies were classified as follows:
(a) less than 3% participants withdrawn;
(b) from 3% to 9.9% of participants withdrawn;
(c) from 10% to 19.9% of participants withdrawn.
Trials were excluded if it is not possible to enter data on an intention-to-treat basis and/or 20% or more participants were excluded.

Data were extracted from the sources and entered onto Review Manager (RevMan 2000), checked for accuracy, and analysed using the RevMan 2000 software (Update Software, Oxford, UK). For dichotomous data, odds ratio and 95% confidence intervals were calculated, and in the absence of heterogeneity, results were pooled using a fixed effects model. Continuous data were pooled using weighted mean differences and 95% confidence intervals.

DESCRIPTION OF STUDIES

Included trials: Tubal ring compared to spring-loaded clip: three trials, including a total of 1327 women (Aranda 1985, Argueta 1980, Stovall 1991),
Modified Pomeroy technique compared to electrocoagulation: two trials, including 1910 women (Sitompul 1984, WHO 1982),
Tubal ring compared to electrocoagulation: two trials, including a total of 599 women (Aranda 1976, Koetsawang 1978),
Modified Pomeroy technique compared to Filshie clip: one trial, including 200 women (Yan 1990),
Hulka-Clemens compared to Filshie clip: one trial, including 200 women (Toplis 1988).

Concealment of allocation was considered adequate in only two trials (Aranda 1985, WHO 1982) while it was considered unclear in the remaining included studies.

The access to the abdomen was performed by different approaches. In five studies, laparoscopy was the method used (Argueta 1980, Stovall 1991, Aranda 1976, Koetsawang 1978, Toplis 1988). Laparotomy was used in two other studies (Aranda 1985, Yan 1990). Minilaparotomy or laparoscopy was used in one study (WHO 1982), and another study compared three different approaches to enter the abdominal cavity (Sitompul 1984).

Electrocoagulation was used in 4 trials, while in only 1 trial the use of unipolar electrocoagulation is specified (Koetsawang 1978). In the other 3 trials, the type of electrocoagulation was not further specified.
All procedures were done by experienced surgeons in two trials (Sitompul 1984, Toplis 1988), while the operation was performed by trainees third year residents in one study (Stovall 1991). In 5 trials (Aranda 1985, Argueta 1980, Aranda 1976, Koetsawang 1978, Yan 1990) the postoperative care was provided by another physician unaware of the procedure.

WHO (WHO 1982) conducted a multicenter study involving 8 centres, 4 in industrialized countries and 4 in non-industrialized countries. Another multicenter, multinational trial was conducted in three developing country centers (Aranda 1985).

The women were discharged usually after 8 hours and follow-up was scheduled at 1 week and 6 weeks post-operatively. Long-term follow-up differs significantly between studies.

In the study of Aranda (Aranda 1985), 663 women were 'randomly allocated' by sealed opaque envelopes to tubal ring or Rocket clip groups in a multicenter, multinational study (San Jose, Costa Rica; San Salvador, El Salvador; Cairo, Egypt). Women had similar socio-economic characteristics, a similar percentage of interval and post-spontaneous abortion procedures (about 55 % and 45 % respectively) was performed in each group. Thirty cases of technical failure (5 % of total) were excluded from the analyses. About 90 % of women in both groups remained hospitalized for at least one night. The operations were performed with general anesthesia in 55 % of cases and with analgesia and/or sedation plus local anesthesia in 45 % of procedures.

In the study of Argueta (Argueta 1980), 299 women were randomly assigned to spring-loaded clip or tubal ring. One surgeon performed all surgical procedures on an outpatient basis. Selected socio-demographic characteristics of the subjects were similar in both groups. In the clip group 54 women (36 %) and 60 (40 %) in the ring group were lost to follow-up at 24 months.

In the study conducted by Stovall (Stovall 1991), 365 women were randomized to the spring-loaded clip group (176 women) and the tubal ring group (189 women). All patients had urine tests for human chorionic gonadotropin (hCG) within 72 hours of their planned surgical procedure. Both groups had similar socio-demographic characteristics. No post-randomization exclusion or losses to follow-up were reported. An average of 16 months (range, 6-24) of follow-up is reported. Trainees (third year residents) performed all procedures. Chromopertubation, performed on all the patients after application of the occluding devices, revealed no dye spillage in any patient.

In the study of Sitompul (Sitompul 1984), an equal number of women were 'randomly allocated' to three groups (100 for minilaparotomy, laparoscopy and culdoscopy), but modified Pomeroy technique was performed for all women in the minilaparotomy and the culdoscopy group, whereas electrocoagulation was used as sterilization method in the laparoscopy group. Five women were excluded after randomisation (3 Pomeroy, 2 electrocoagulation). All women had terminated their last pregnancy at least 6 weeks prior to sterilization.

WHO (WHO 1982), recruited 1827 women (912 for Pomeroy and 915 for electrocoagulation). The post-randomisation exclusion rate was about 12% (121 women) in the Pomeroy group and about 10% (96 women) in the electrocoagulation group due to protocol violations. There were important differences in baseline characteristics mainly due to one centre (Bangkok) where women in the electrocoagulation group were older, had more living children and had been married longer. Also, women in the Pomeroy group were lighter and had a lower ponderal index, mainly due to the contribution of two centres (Bangkok, Havana). These differences were statistically significant for the Bangkok centre. In the three developed country centres (London, Los Angeles, Sydney) all operations were performed under general anesthesia, whereas in two developing country centres (Bangkok, Seoul) local anesthesia was used for both procedures. In Havana and Singapore all patients in the electrocoagulation group received general anesthesia and most Pomeroy procedures were done under spinal/ epidural anesthesia. In Santiago all Pomeroy procedures were performed under spinal, all electrocoagulation procedures under local anesthesia. In all centres sedatives for pre-medication were used.

In another study (Aranda 1976), 299 women who were at least six weeks postpartum were randomly assigned to electrocoagulation or tubal ring groups. Women in the two groups were similar with respect to socio-demographic characteristics. One case of technical failure in the tubal ring group was excluded from the analyses.

Koetsawang (Koetsawang 1978) randomized 300 women in equal number to the electrocoagulation (unipolar) and the tubal ring groups. All operations were performed on an outpatient basis for women who had not recently been pregnant. The two groups had similar socio-economic characteristics. Six months follow-up was completed for all patients.

Yan (Yan 1990) randomized 100 women postpartum to Pomeroy and 100 to Filshie clip. The patients were followed up to 24 months after sterilization. Selected socio-demographic characteristics (age, total live births and previous contraceptive use) were found similar between groups. All procedures were performed by one of the authors.

In the trial of Toplis (Toplis 1988), 200 non-pregnant women were randomly allocated to two groups comparing Filshie clip (titanium) versus Hulka-Clemens clip (spring-loaded). The authors were the only surgeons performing the procedures. Women in the Filshie group were slightly heavier than those in the Hulka clip group. Two patients from the Hulka clip group were excluded from the study because of technical failure.

METHODOLOGICAL QUALITY

Method of randomization was considered adequate in two studies (Aranda 1985; WHO 1982). Concealment of allocation was adequate for only one study. In 8 trials, it was unclear whether concealment was adequate. Methods for concealing the allocation included sealed opaque envelopes (Aranda 1985; Aranda 1976), sealed preprinted labels (Yan 1990) and 'envelope' with no other specification (Toplis 1988). Sequentially numbered, sealed opaque envelopes were used in one trial (WHO 1982). The method of allocation was not specified in the other four trials. Most trials with unclear concealment of allocation were described as 'randomized' with no details on how this was achieved. Methods for generating the random sequence were described in 3 trials (33%). These included: computer generation (Aranda 1985; Stovall 1991) and centrally generated by computer (WHO 1982).

RESULTS

There were no cases of operative mortality in the only study reporting this outcome (WHO 1982). No statistically significant difference in operative time was reported in the three trials evaluating this outcome (Stovall 1991, Koetsawang 1978, Toplis 1988).

1. Tubal ring versus clip:

In the trial comparing major morbidity numbers were too small for any reliable conclusion [1 study, 663 women (Peto OR 0.14; 95 % CI 0.00, 7.05)]. Overall minor morbidity was found to be more frequent in the ring group [2 studies, 962 women (Peto OR 2.15; 95 % CI 1.22, 3.78)]. Failure of technical approach occurred more often in the ring group [2 studies, 962 women (Peto OR 3.87; 95 % CI 1.9,7.89)]. The three trials reporting pregnancy rates [Aranda 1985, Argueta 1980, Stovall 1991 (1327 women)] failed to show a significant difference between the two groups (Peto OR 0.70; 95 % CI 0.28-1.76). No statistical significant differences were found regarding technical difficulties [2 studies, 962 women (Peto OR 1.03; 95 % CI 0.55, 1.95)], women complaints [2 studies, 962 women (Peto OR 1.18; 95 % CI 0.90, 1.54)] or menstrual irregularities [2 studies, 962 women (Peto OR 1.61; 95 % CI 0.75, 3.49)].

2. Modified Pomeroy versus electrocoagulation:

Major morbidity was higher in the Pomeroy group [2 studies, 2127 women (Peto OR 2.87; 95 % CI 1.13,7.25)], however one case of burn to the small bowel is reported in the electrocoagulation group. Only one study (WHO 1982, 1827 women) found a statistical significant difference in total minor morbidity favourable to the electrocoagulation group. One pregnancy was reported, in the Pomeroy group, in the only trial reporting on this outcome (Sitompul 1984). More women in the Pomeroy group reported postoperative abdominal pain [2 studies, 2127 women (Peto OR 3.85; 95 % CI 2.91, 5.10)].

3. Tubal ring versus electrocoagulation:

Only one study (Aranda 1976, 299 women) reported an adverse episode of major morbidity due to a burn of the small intestine in the electrocoagulation group. There were no statistically significant differences in minor morbidity, technical failures or technical difficulties between the groups. No pregnancies were reported. More women in the ring group reported postoperative abdominal pain [2 studies, 599 women (Peto OR 3.28; 95 % CI 2.31, 4.66)]. There was no difference between groups in either operative time or menstrual irregularities.

4. Modified Pomeroy versus clip:

In the trial comparing these two interventions (Yan 1990, 200 women) there were no significant differences between groups with regard to minor morbidity and menstrual irregularities, but these results based on a small sample size. One pregnancy occurred in the Pomeroy group.

5. Filshie clip versus Hulka-Clemens clip:

One case of tubal transection, requiring no additional intervention occurred in the Filshie clip group. No other major or minor complications were detected in the only trial that compared the two methods (Toplis 1988, 200 women).
No clinical or statistical significant differences between the two groups were observed.

DISCUSSION

The main clinical questions considered in this review are the effectiveness and safety of sterilization methods in reducing the risk of pregnancy and the satisfaction of both patients and surgeons.

Major morbidity was found to be more frequent in the Pomeroy group when compared to electrocoagulation. Nevertheless, it must be considered that this could be due to the way of entry in the abdominal cavity, taking into account that the majority of the Pomeroy procedures are associated with laparotomy and electrocoagulation are mostly performed via laparoscopy. The risks of burns to the bowel and other organs, although observed infrequently with electrocoagulation should be taken as a serious complication of the procedure.
Despite the concern about unipolar electrocoagulation on this matter, the results of this review showed no difference between unipolar and bipolar electrocoagulation in terms of electrical burns. However the data were limited to make a conclusion. In the two trials where these major complications were observed electrocoagulation was not further specified.

The failure rate was low for all procedures, regardless of being performed postpartum or as an interval procedure. No difference with regard to failure rate was found within the subgroups.
However, laparoscopic sterilization performed by third year residents showed a higher rate of failure (2.64 % for tubal ring and 4.54 % for spring-loaded clip) (Stovall 1991) compared to studies in which experienced surgeons performed the operations (Aranda 1985, Argueta 1980). Aranda (Aranda 1985) reported a failure rate of 1.47 % for tubal ring and 1.34 % for clip group, while no pregnancies were observed in neither group in the study conducted by Argueta (Argueta 1980). Surgeons' experience and failure rates seems correlated when laparoscopic techniques such as spring-loaded clip or tubal ring are used. Because of the small sample and short follow-up of these studies for rare outcomes, no clinical recommendations or conclusions can be made.

Two randomized controlled trials, conducted by Sitompul (Sitompul 1984) and WHO (WHO 1992) found a statistically significant difference
between Pomeroy and electrocoagulation regarding postoperative abdominal pain. These trials showed that postoperative pain was more frequent in the first 24 hours but not at the follow-up visit, in

the Pomeroy group. Several studies evaluate the application of local anaesthetics to the tubes during a tubal sterilization procedure in a way to reduce operative and postoperative pain (Baram 1990, Ezeh 1995, Thompson 1987, Pelland 1976). It was not the objective of this review to evaluate the effectiveness of the application of local agents to the tubes compared to placebo in reducing postoperative pain.

The randomized controlled trials included in this review have a too short follow-up period to provide evidence on failure rates. Non-randomized long-term follow-up studies showed that pregnancy after sterilization can occur as late as seven years post-surgery (Koetsawang 1990). In a study conducted by Peterson (Peterson 1996) the probability of failure between years 5 and 10 after sterilization ranged from 1.2 per 1000 procedures for postpartum partial salpingectomy to 8.3 per 1000 procedures for bipolar coagulation. Failures in women sterilized by bipolar coagulation at the age of 18 to 27 years were observed between 5 and 10 years after the procedure. They conclude that younger women were more likely to have a sterilization failure.

Another issue related to age is the possibility of regret, that was found to be higher for women of 30 years of age or younger (20.3 %) than those over age 30 (5.9 %) in a multicenter cohort study with 14 years of follow-up (Hillis 1999) highlighting that counseling and informed consent are crucial. This aspect was not evaluated or mentioned in the included studies.

Other methods including chemical instillation or tubal plugs are used infrequently and mostly in experimental trials. Further research may show a place for using these methods.

Aspects such as training, costs and maintenance of equipment, may be also important factors in deciding which method to choose. Personal preferences of both patients and physicians can influence the choice of the method.

AUTHORS' CONCLUSIONS

Implications for practice

Major morbidity and failure rates were found to be rare outcomes with any method. The election of the tubal occlusion technique should include costs, maintenance of equipment, the setting, the surgeons experience and the patient age.
Proper education and training must be provided before incorporating complex laparoscopic techniques (e.g. clip, tubal ring) in places with limited resources.

Implications for research

Data on rare and long term outcomes are available from cohort studies, rather than from randomized controlled trials.
Further comparative trials are not considered to be high priority for research.
Differences on morbidity can be attributed to the way of entry to the abdominal cavity or the method of anesthesia. Minilaparotomy approach versus endoscopic techniques were compared in another systematic review (Kulier 2000), while the comparison of the different anesthetic techniques for tubal sterilization could be reviewed in the future.

POTENTIAL CONFLICT OF INTEREST

None.

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- Centro Rosarino de Estudios Perinatales (CREP), Rosario ARGENTINA

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* *Indicates the major publication for the study*

TABLES

Characteristics of included studies

Study	Aranda 1976
Methods	Randomisation not specified. Concealment of allocation by sealed envelopes containing a card which specified the technique of tubal occlusion.
Participants	299 women requesting sterilization for family planning reasons, at least six weeks postpartum. Conducted at the Hospital Mexico, San Jose, Costa Rica.
Interventions	Electrocoagulation versus tubal ring all laparoscopy. All under local anesthesia and intravenous sedation.
Outcomes	Surgical and early postoperative complications and complaints.

Characteristics of included studies (*Continued*)

Notes	Blinding of postoperative evaluation.
Allocation concealment	B – Unclear

Study	**Aranda 1985**
Methods	Multicenter study. Randomisation by computer generated labels. Concealment of allocation by sealed opaque envelopes. Not stated if sequentially numbered.
Participants	663 women requesting sterilization to limit family size and free of major systemic and pelvic abnormalities. Interval (55%) and post spontaneous abortion (45%). Conducted in San Jose, San Salvador and Cairo.
Interventions	Tubal ring versus Rocket clip via minilaparotomy. Under general anesthesia (55%) or local anesthesia and intravenous sedation.
Outcomes	Major and minor morbidity, technical failures and difficulties, failure rates and complaints.
Notes	Blinding of postoperative evaluation.
Allocation concealment	B – Unclear

Study	**Argueta 1980**
Methods	Not specified method of randomisation.
Participants	299 women requesting sterilization at Asociacion Demografica Salvadorena, San Salvador.
Interventions	Spring-loaded clip versus tubal ring all laparoscopy. All under local anesthesia and intravenous sedation.
Outcomes	Operative morbidity, technical failures and difficulties, failure rates, complaints.
Notes	Patients and postoperative evaluation blinding.
Allocation concealment	B – Unclear

Study	**Koetsawang 1978**
Methods	Not specified method of randomisation.
Participants	300 women requesting sterilization for family planning purposes at the Siriraj Hospital in Bangkok.
Interventions	Unipolar electrocoagulation versus tubal ring via laparoscopy. All under local anesthesia and intravenous sedation
Outcomes	Operative morbidity, technical failures and difficulties, failure rates, operative time, complaints.
Notes	Postoperative evaluation blinding, prophylactic antibiotics for 5 days. Up to 54% loss to follow up at 12 months.
Allocation concealment	B – Unclear

Study	**Sitompul 1984**
Methods	Not specified method of randomisation.
Participants	300 women requesting sterilization at the University Hospital in Medan, Indonesia. Exclusion criteria: heart, pulmonary, endocrine or other systemic illness, PID or vulvovaginal infections.
Interventions	Modified Pomeroy technique (via minilaparotomy or culdoscopy) versus electrocoagulation (via laparoscopy). All under local anaesthesia and 10mg Valium intravenous.
Outcomes	Operative time, hospitalisation, postoperative complications, failure rates.
Notes	
Allocation concealment	B – Unclear

Study	Stovall 1991
Methods	Randomisation by computer-generated schedule.
Participants	365 women at the University of Tennessee, Memphis.
Interventions	Spring-loaded clip (Hulka-Clemens) versus tubal ring (Falope ring). All procedures via laparoscopy.
Outcomes	Failure rates
Notes	All procedures performed by third-year residents. Urine hCG within 72 hs before procedure. Methylene-blue test with no spillage recorded.
Allocation concealment	B – Unclear

Study	Toplis 1988
Methods	Randomisation not specified. Concealment of allocation by envelope opened immediately before operation.
Participants	200 women non pregnant at the Churchill Hospital, Oxford
Interventions	Spring-loaded clip (Hulka-Clemens) versus Filshie clip (titanium clip) via laparoscopy.
Outcomes	Operative morbidity, operative time, complaints.
Notes	Authors as the only surgeons.
Allocation concealment	B – Unclear

Study	WHO 1982
Methods	Multicenter, multinational randomised study. Randomisation centrally generated by WHO. Concealment of allocation by sealed, sequentially numbered opaque envelopes.
Participants	1827 healthy women with at least one child and eligible for both interventions. Exclusion criteria: pelvic pathologies, history of previous PID or peritonitis, scar below the umbilicus or any condition which would increase the risk of any surgical procedure. Conducted in Bangkok, Havana, London, Los Angeles, Santiago, Seoul, Singapore, Sydney.
Interventions	Modified Pomeroy method via minilaparotomy versus electrocoagulation via laparoscopy.
Outcomes	Major and minor morbidity, technical failures, postoperative complaints.
Notes	Anesthesia standardized within individual centers according to routine practice in the institution. All procedures performed by experienced surgeons.
Allocation concealment	A – Adequate

Study	Yan 1990
Methods	Randomisation not specified. Concealment of allocation by sealed preprinted labels.
Participants	200 women postpartum at the Tri- Service General Hospital, Taipei, Taiwan.
Interventions	Pomeroy method versus Filshie clip all subumbilical minilaparotomy. 88% under epidural anesthesia and the remainder under local anesthesia.
Outcomes	Complications, menstrual irregularities, failure rates.
Notes	Blinding of postoperative evaluation.
Allocation concealment	B – Unclear

Characteristics of excluded studies

Study	Reason for exclusion
Alvarez 1989	Not acceptable post-randomization exclusion. From a total of 38 women enrolled, four became pregnant before the procedure was done, six were excluded for another reason and seven did not return for the second month visit.

Characteristics of excluded studies (*Continued*)

Bordahl 1984	About forty percent posrandomization exclusion.
Dueholm 1986	Inadequate randomization.
Lee 1991	"Intention to treat" analysis was not performed. Patients found to have tubal disease at the time of surgery underwent sterilization with standard modified Pomeroy technique.
Lipscomb 1994	Unknown number of losses to follow-up.
Madrigal 1977	"Intention to treat" analysis was not performed. One patient from the clip group was changed to the electrocoagulation group due to a technical problem and was included in the latter for the further analysis.
Murray 1992	The method of allocation was considered quasi randomization.
Rivera 1989	Method of randomization not appropriate. The groups were divided in equal number of patients. In addition, a fourth group was taken as a control group.
Sokal 2000	No "intention to treat" analysis.
Toppozada 1989	Method of randomization not appropriate. The groups were divided in equal number of patients.

ANALYSES

Comparison 01. Tubal ring versus clip

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Operative mortality	0	0	Peto Odds Ratio 95% CI	Not estimable
02 Major morbidity, total	1	545	Peto Odds Ratio 95% CI	0.14 [0.00, 7.05]
03 Major morbidity, details	1	545	Peto Odds Ratio 95% CI	0.14 [0.00, 7.05]
04 Minor morbidity, total	2	842	Peto Odds Ratio 95% CI	2.15 [1.22, 3.78]
05 Minor morbidity, details	7	2821	Peto Odds Ratio 95% CI	2.11 [1.21, 3.68]
06 Technical failures	2	730	Peto Odds Ratio 95% CI	3.87 [1.90, 7.89]
07 Technical dificulties	2	844	Peto Odds Ratio 95% CI	1.03 [0.55, 1.95]
08 Failure rate, total	3	1089	Peto Odds Ratio 95% CI	0.71 [0.28, 1.76]
09 Failure rate, details	2	854	Peto Odds Ratio 95% CI	1.09 [0.22, 5.46]
10 Operative time	1	297	Weighted Mean Difference (Fixed) 95% CI	Not estimable
11 Hospital stay more 24 h	0	0	Weighted Mean Difference (Fixed) 95% CI	Not estimable
12 Complaints	2	842	Peto Odds Ratio 95% CI	1.18 [0.90, 1.54]
13 Menstrual irregularities	2	612	Peto Odds Ratio 95% CI	1.61 [0.75, 3.49]
14 Women's satisfaction			Other data	No numeric data
15 Surgeon's satisfaction			Other data	No numeric data

Comparison 02. Modified Pomeroy versus electrocoagulation

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Operative mortality	1	1610	Peto Odds Ratio 95% CI	Not estimable
02 Major morbidity, total	2	1905	Peto Odds Ratio 95% CI	2.87 [1.13, 7.25]
03 Major morbidity, details	3	2200	Peto Odds Ratio 95% CI	2.84 [1.13, 7.16]
04 Minor morbidity, total	2	1905	Peto Odds Ratio 95% CI	1.60 [1.10, 2.33]
05 Minor morbidity, details	4	5125	Peto Odds Ratio 95% CI	1.58 [1.09, 2.28]
06 Technical failures	2	4	Peto Odds Ratio 95% CI	Not estimable
07 Technical dificulties	0	0	Peto Odds Ratio 95% CI	Not estimable
08 Failure rate, total	1	295	Peto Odds Ratio 95% CI	4.47 [0.07, 286.78]
09 Failure rate, details	1	295	Peto Odds Ratio 95% CI	4.47 [0.07, 286.78]
10 Operative time	0	0	Weighted Mean Difference (Fixed) 95% CI	Not estimable
11 Hospital stay more 24 h	0	0	Weighted Mean Difference (Fixed) 95% CI	Not estimable

12 Complaints	3	3515	Peto Odds Ratio 95% CI	2.14 [1.74, 2.62]
13 Menstrual irregularities	0	0	Peto Odds Ratio 95% CI	Not estimable
14 Women's satisfaction			Other data	No numeric data
15 Surgeon's satisfaction			Other data	No numeric data

Comparison 03. Tubal ring versus electrocoagulation

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Operative mortality	0	0	Peto Odds Ratio 95% CI	Not estimable
02 Major morbidity, total	2	596	Peto Odds Ratio 95% CI	0.14 [0.00, 7.01]
03 Major morbidity, details	1	298	Peto Odds Ratio 95% CI	0.14 [0.00, 7.01]
04 Minor morbidity, total	2	596	Peto Odds Ratio 95% CI	0.97 [0.50, 1.87]
05 Minor morbidity, details	6	1782	Peto Odds Ratio 95% CI	0.97 [0.51, 1.85]
06 Technical failures, total	2	596	Peto Odds Ratio 95% CI	3.42 [0.59, 19.81]
07 Technical dificulties	1	298	Peto Odds Ratio 95% CI	0.14 [0.01, 1.33]
08 Failure rate, total	1	160	Peto Odds Ratio 95% CI	Not estimable
09 Failure rate, details	0	0	Peto Odds Ratio 95% CI	Not estimable
10 Operative time	1	298	Weighted Mean Difference (Fixed) 95% CI	Not estimable
11 Hospital stay more 24 h	0	0	Weighted Mean Difference (Fixed) 95% CI	Not estimable
12 Complaints	5	1488	Peto Odds Ratio 95% CI	2.32 [1.78, 3.04]
13 Menstrual irregularities	1	296	Peto Odds Ratio 95% CI	0.90 [0.56, 1.45]
14 Women's satisfaction			Other data	No numeric data
15 Surgeon's satisfaction			Other data	No numeric data

Comparison 04. Modified Pomeroy versus Filshie clip

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Operative mortality	0	0	Peto Odds Ratio 95% CI	Not estimable
02 Major morbidity, total	0	0	Peto Odds Ratio 95% CI	Not estimable
03 Major morbidity, details	0	0	Peto Odds Ratio 95% CI	Not estimable
04 Minor morbidity, total	1	193	Peto Odds Ratio 95% CI	7.39 [0.46, 119.01]
05 Minor morbidity, details	1	193	Peto Odds Ratio 95% CI	7.39 [0.46, 119.01]
06 Technical failures	0	0	Peto Odds Ratio 95% CI	Not estimable
07 Technical dificulties	0	0	Peto Odds Ratio 95% CI	Not estimable
08 Failure rate, total	1	148	Peto Odds Ratio 95% CI	8.28 [0.16, 419.87]
09 Failure rate, details	1	148	Peto Odds Ratio 95% CI	8.28 [0.16, 419.87]
10 Operative time	0	0	Weighted Mean Difference (Fixed) 95% CI	Not estimable
11 Hospital stay more 24 h	0	0	Weighted Mean Difference (Fixed) 95% CI	Not estimable
12 Complaints	0	0	Peto Odds Ratio 95% CI	Not estimable
13 Menstrual irregularities	1	146	Peto Odds Ratio 95% CI	2.42 [0.90, 6.47]
14 Women's satisfaction			Other data	No numeric data
15 Surgeon's satisfaction			Other data	No numeric data

Comparison 05. Hulka-Clemens versus Filshie clip

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Operative mortality	0	0	Peto Odds Ratio 95% CI	Not estimable
02 Major morbidity, total	0	0	Peto Odds Ratio 95% CI	Not estimable
03 Major morbidity, details	0	0	Peto Odds Ratio 95% CI	Not estimable
04 Minor morbidity, total	1	197	Peto Odds Ratio 95% CI	0.14 [0.00, 7.32]

05 Minor morbidity, details	1	197	Peto Odds Ratio 95% CI	0.14 [0.00, 7.32]
06 Technical failures	0	0	Peto Odds Ratio 95% CI	Not estimable
07 Technical dificulties	1	197	Peto Odds Ratio 95% CI	2.05 [0.89, 4.75]
08 Failure rate, total	0	0	Peto Odds Ratio 95% CI	Not estimable
09 Failure rate, details	0	0	Peto Odds Ratio 95% CI	Not estimable
10 Operative time	1	197	Weighted Mean Difference (Fixed) 95% CI	0.70 [-0.04, 1.44]
11 Hospital stay more 24 h	0	0	Weighted Mean Difference (Fixed) 95% CI	Not estimable
12 Complaints	1	197	Peto Odds Ratio 95% CI	1.74 [0.99, 3.03]
13 Menstrual irregularities	0	0	Peto Odds Ratio 95% CI	Not estimable
14 Women's satisfaction			Other data	No numeric data
15 Surgeon's satisfaction			Other data	No numeric data

INDEX TERMS

Medical Subject Headings (MeSH)

Electrocoagulation; Randomized Controlled Trials; Sterilization, Tubal [adverse effects; *methods]; Surgical Instruments

MeSH check words

Female; Humans

COVER SHEET

Title	Techniques for the interruption of tubal patency for female sterilisation
Authors	Nardin JM, Kulier R, Boulvain M
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Date new studies found but not yet included/excluded	Information not supplied by author
Date new studies found and included/excluded	Information not supplied by author
Date authors' conclusions section amended	Information not supplied by author
Contact address	Dr. Juan Manuel Nardin Centro Rosarino de Estudios Perinatales Pueyrredon 985 Rosario S2000QIC

ARGENTINA
E-mail: jmnardin@crep.com.ar
Tel: +54 341 437 6567

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GRAPHS AND OTHER TABLES

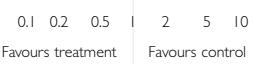
Analysis 01.02. Comparison 01 Tubal ring versus clip, Outcome 02 Major morbidity, total

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 01 Tubal ring versus clip

Outcome: 02 Major morbidity, total

Study	Ring n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Major morbidity, total					
Aranda 1985	0/268	1/277		100.0	0.14 [0.00, 7.05]
Total (95% CI)	268	277		100.0	0.14 [0.00, 7.05]
Total events: 0 (Ring), 1 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.98 p=0.3					



Analysis 01.03. Comparison 01 Tubal ring versus clip, Outcome 03 Major morbidity, details

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 01 Tubal ring versus clip

Outcome: 03 Major morbidity, details

Study	Ring n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Procedure related injuries requiring additional operation or blood transfusion					
Aranda 1985	0/268	1/277		100.0	0.14 [0.00, 7.05]
Subtotal (95% CI)	268	277		100.0	0.14 [0.00, 7.05]
Total events: 0 (Ring), 1 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.98 p=0.3					
02 Re-hospitalisation as a consequence of operation					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Ring), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
Total (95% CI)	268	277		100.0	0.14 [0.00, 7.05]
Total events: 0 (Ring), 1 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.98 p=0.3					

Analysis 01.04. Comparison 01 Tubal ring versus clip, Outcome 04 Minor morbidity, total

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 01 Tubal ring versus clip

Outcome: 04 Minor morbidity, total

Study	Ring n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Minor morbidity, total					
Aranda 1985	17/268	6/277		45.7	2.81 [1.22, 6.46]
Argueta 1980	18/148	11/149		54.3	1.72 [0.80, 3.69]
Total (95% CI)	416	426		100.0	2.15 [1.22, 3.78]
Total events: 35 (Ring), 17 (Clip)					
Test for heterogeneity chi-square=0.72 df=1 p=0.40 I^2 =0.0%					
Test for overall effect z=2.66 p=0.008					

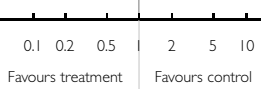
Analysis 01.05. Comparison 01 Tubal ring versus clip, Outcome 05 Minor morbidity, details

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 01 Tubal ring versus clip

Outcome: 05 Minor morbidity, details

Study	Ring n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Procedure related injuries with no additional operation					
Aranda 1985	3/148	0/149		6.0	7.54 [0.78, 73.06]
Argueta 1980	10/268	4/277		27.5	2.49 [0.86, 7.19]
Subtotal (95% CI)	416	426		33.5	3.04 [1.16, 7.94]
Total events: 13 (Ring), 4 (Clip)					
Test for heterogeneity chi-square=0.75 df=1 p=0.39 I^2 =0.0%					
Test for overall effect z=2.27 p=0.02					
02 Urogenital infections					
Aranda 1985	6/268	2/277		15.9	2.85 [0.71, 11.49]
Argueta 1980	0/148	1/149		2.0	0.14 [0.00, 6.87]
Subtotal (95% CI)	416	426		17.9	2.02 [0.54, 7.53]
Total events: 6 (Ring), 3 (Clip)					
Test for heterogeneity chi-square=2.05 df=1 p=0.15 I^2 =51.2%					
Test for overall effect z=1.05 p=0.3					
03 Wound infection					
Aranda 1985	1/268	0/277		2.0	7.64 [0.15, 385.31]
Argueta 1980	14/147	10/149		44.6	1.46 [0.63, 3.35]
Subtotal (95% CI)	415	426		46.6	1.56 [0.69, 3.54]
Total events: 15 (Ring), 10 (Clip)					
Test for heterogeneity chi-square=0.66 df=1 p=0.42 I^2 =0.0%					
Test for overall effect z=1.08 p=0.3					
04 Post operative temperature > 38 C without hospitalisation					
Argueta 1980	1/147	0/149		2.0	7.49 [0.15, 377.52]
Subtotal (95% CI)	147	149		2.0	7.49 [0.15, 377.52]
Total events: 1 (Ring), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=1.01 p=0.3					
Total (95% CI)	1394	1427		100.0	2.11 [1.21, 3.68]
Total events: 35 (Ring), 17 (Clip)					
Test for heterogeneity chi-square=4.93 df=6 p=0.55 I^2 =0.0%					
Test for overall effect z=2.63 p=0.008					



Analysis 01.06. Comparison 01 Tubal ring versus clip, Outcome 06 Technical failures

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 01 Tubal ring versus clip

Outcome: 06 Technical failures

Study	Ring n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
Aranda 1985	25/268	5/277		93.5	4.24 [2.03, 8.84]
Argueta 1980	1/89	1/96		6.5	1.08 [0.07, 17.42]
Total (95% CI)	357	373		100.0	3.87 [1.90, 7.89]

Total events: 26 (Ring), 6 (Clip)

Test for heterogeneity chi-square=0.87 df=1 p=0.35 I^2 =0.0%

Test for overall effect z=3.73 p=0.0002

Analysis 01.07. Comparison 01 Tubal ring versus clip, Outcome 07 Technical dificulties

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 01 Tubal ring versus clip

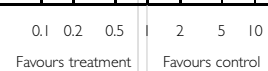
Outcome: 07 Technical dificulties

Study	Ring n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
Aranda 1985	18/268	14/277		79.4	1.35 [0.66, 2.76]
Argueta 1980	2/149	6/150		20.6	0.36 [0.09, 1.47]
Total (95% CI)	417	427		100.0	1.03 [0.55, 1.95]

Total events: 20 (Ring), 20 (Clip)

Test for heterogeneity chi-square=2.69 df=1 p=0.10 I^2 =62.9%

Test for overall effect z=0.09 p=0.9



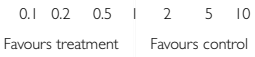
Analysis 01.08. Comparison 01 Tubal ring versus clip, Outcome 08 Failure rate, total

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 01 Tubal ring versus clip

Outcome: 08 Failure rate, total

Study	Ring n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Failure rate, total					
Aranda 1985	3/204	3/223		32.0	1.09 [0.22, 5.48]
× Argueta 1980	0/149	0/148		0.0	Not estimable
Stovall 1991	5/189	8/176		68.0	0.58 [0.19, 1.74]
Total (95% CI)	542	547		100.0	0.71 [0.28, 1.76]
Total events: 8 (Ring), 11 (Clip)					
Test for heterogeneity chi-square=0.41 df=1 p=0.52 I^2 =0.0%					
Test for overall effect z=0.74 p=0.5					



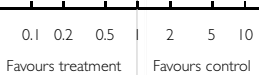
Analysis 01.09. Comparison 01 Tubal ring versus clip, Outcome 09 Failure rate, details

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 01 Tubal ring versus clip

Outcome: 09 Failure rate, details

Study	Ring n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Failure rate =< 1 year, total					
Aranda 1985	2/204	3/223		83.2	0.73 [0.13, 4.26]
Subtotal (95% CI)	204	223		83.2	0.73 [0.13, 4.26]
Total events: 2 (Ring), 3 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.35 p=0.7					
02 Failure rate =< 1 year, extrauterine pregnancy					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Ring), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
03 Failure rate > 1 year, total					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Ring), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					



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Study	Ring n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
04 Failure rate > 1 year, extrauterine pregnancy					
Aranda 1985	1/204	0/223		16.8	8.11 [0.16, 410.33]
Subtotal (95% CI)	204	223		16.8	8.11 [0.16, 410.33]
Total events: 1 (Ring), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=1.05 p=0.3					
Total (95% CI)	408	446		100.0	1.09 [0.22, 5.46]
Total events: 3 (Ring), 3 (Clip)					
Test for heterogeneity chi-square=1.20 df=1 p=0.27 I^2 =16.9%					
Test for overall effect z=0.11 p=0.9					

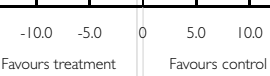
Analysis 01.10. Comparison 01 Tubal ring versus clip, Outcome 10 Operative time

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 01 Tubal ring versus clip

Outcome: 10 Operative time

Study	Ring N	Ring Mean(SD)	Clip N	Clip Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
× Argueta 1980	149	7.80 (0.00)	148	7.80 (0.00)		0.0	Not estimable
Total (95% CI)	149		148			0.0	Not estimable
Test for heterogeneity: not applicable							
Test for overall effect: not applicable							



Analysis 01.11. Comparison 01 Tubal ring versus clip, Outcome 11 Hospital stay more 24 h

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 01 Tubal ring versus clip

Outcome: 11 Hospital stay more 24 h

Study	Ring N Mean(SD)	Clip N Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Total (95% CI)	0	0		0.0	Not estimable
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					

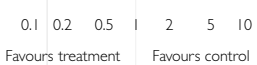
Analysis 01.12. Comparison 01 Tubal ring versus clip, Outcome 12 Complaints

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 01 Tubal ring versus clip

Outcome: 12 Complaints

Study	Ring n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Post operative pain, < 24 h					
Aranda 1985	145/268	145/277		64.6	1.07 [0.77, 1.50]
Argueta 1980	83/148	71/149		35.4	1.40 [0.89, 2.21]
Subtotal (95% CI)	416	426		100.0	1.18 [0.90, 1.54]
Total events: 228 (Ring), 216 (Clip)					
Test for heterogeneity chi-square=0.85 df=1 p=0.36 I^2 =0.0%					
Test for overall effect z=1.19 p=0.2					
02 Post operative analgesic use					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Ring), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
03 Persistent pain at follow-up visit					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Ring), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
Total (95% CI)	416	426		100.0	1.18 [0.90, 1.54]
Total events: 228 (Ring), 216 (Clip)					
Test for heterogeneity chi-square=0.85 df=1 p=0.36 I^2 =0.0%					
Test for overall effect z=1.19 p=0.2					



Analysis 01.13. Comparison 01 Tubal ring versus clip, Outcome 13 Menstrual irregularities

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 01 Tubal ring versus clip

Outcome: 13 Menstrual irregularities

Study	Ring n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
Aranda 1985	14/204	8/223		81.0	1.95 [0.83, 4.60]
Argueta 1980	2/89	3/96		19.0	0.72 [0.12, 4.23]
Total (95% CI)	293	319		100.0	1.61 [0.75, 3.49]
Total events: 16 (Ring), 11 (Clip)					
Test for heterogeneity chi-square=0.99 df=1 p=0.32 I^2 =0.0%					
Test for overall effect z=1.22 p=0.2					

Analysis 01.14. Comparison 01 Tubal ring versus clip, Outcome 14 Women's satisfaction

Women's satisfaction

Study

Analysis 01.15. Comparison 01 Tubal ring versus clip, Outcome 15 Surgeon's satisfaction

Surgeon's satisfaction

Study

Analysis 02.01. Comparison 02 Modified Pomeroy versus electrocoagulation, Outcome 01 Operative mortality

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 02 Modified Pomeroy versus electrocoagulation

Outcome: 01 Operative mortality

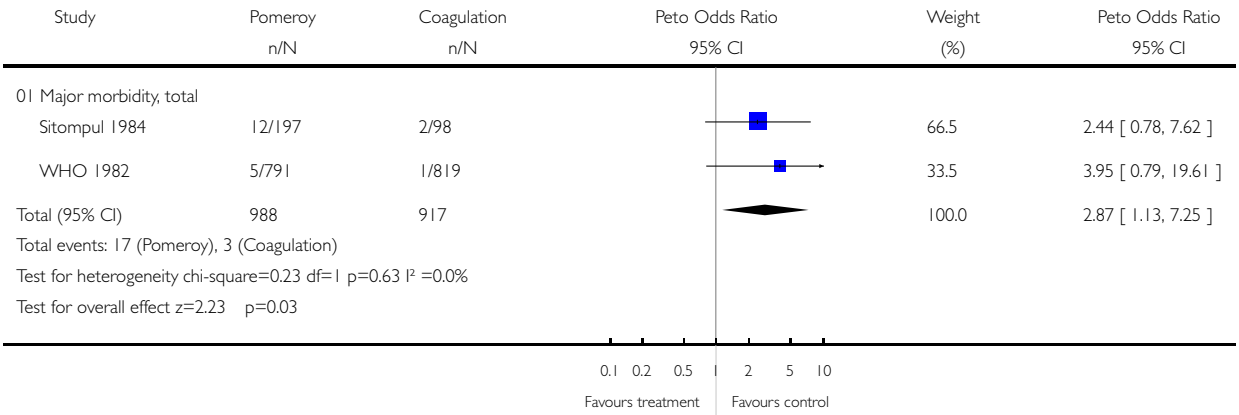
Study	Pomeroy n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
× WHO 1982	0/791	0/819		0.0	Not estimable
Total (95% CI)	791	819		0.0	Not estimable
Total events: 0 (Pomeroy), 0 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					

Analysis 02.02. Comparison 02 Modified Pomeroy versus electrocoagulation, Outcome 02 Major morbidity, total

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 02 Modified Pomeroy versus electrocoagulation

Outcome: 02 Major morbidity, total

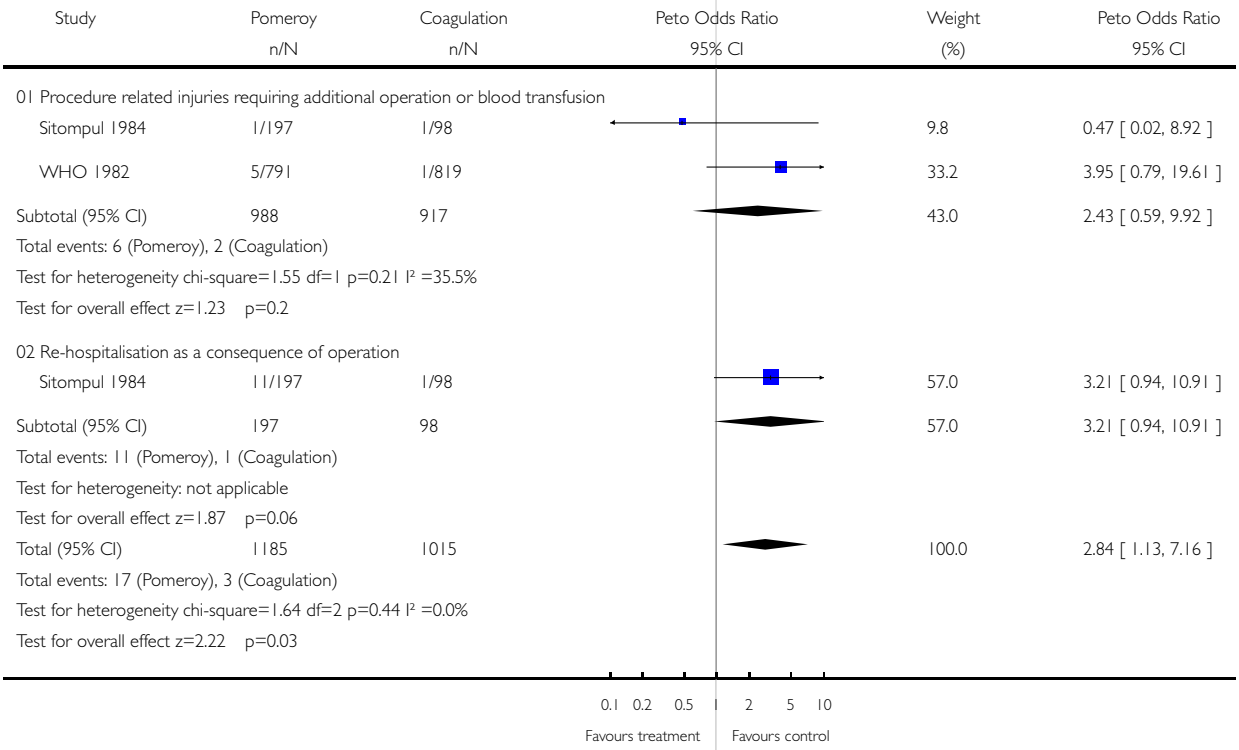


Analysis 02.03. Comparison 02 Modified Pomeroy versus electrocoagulation, Outcome 03 Major morbidity, details

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 02 Modified Pomeroy versus electrocoagulation

Outcome: 03 Major morbidity, details



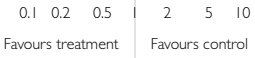
Analysis 02.04. Comparison 02 Modified Pomeroy versus electrocoagulation, Outcome 04 Minor morbidity, total

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 02 Modified Pomeroy versus electrocoagulation

Outcome: 04 Minor morbidity, total

Study	Pomeroy n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Minor morbidity, total					
Sitompul 1984	3/197	1/98		3.2	1.45 [0.18, 11.77]
WHO 1982	68/791	45/819		96.8	1.61 [1.10, 2.36]
Total (95% CI)	988	917		100.0	1.60 [1.10, 2.33]
Total events: 71 (Pomeroy), 46 (Coagulation)					
Test for heterogeneity chi-square=0.01 df=1 p=0.93 I^2 =0.0%					
Test for overall effect z=2.46 p=0.01					



Analysis 02.05. Comparison 02 Modified Pomeroy versus electrocoagulation, Outcome 05 Minor morbidity, details

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 02 Modified Pomeroy versus electrocoagulation

Outcome: 05 Minor morbidity, details

Study	Pomeroy n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Procedure related injuries with no additional operation					
WHO 1982	1/791	2/819		2.7	0.53 [0.06, 5.11]
Subtotal (95% CI)	791	819		2.7	0.53 [0.06, 5.11]
Total events: 1 (Pomeroy), 2 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.55 p=0.6					
02 Urogenital infections					
WHO 1982	18/791	23/819		35.5	0.81 [0.43, 1.50]
Subtotal (95% CI)	791	819		35.5	0.81 [0.43, 1.50]
Total events: 18 (Pomeroy), 23 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.68 p=0.5					
03 Wound infection					
WHO 1982	49/791	20/819		58.7	2.49 [1.54, 4.04]
Subtotal (95% CI)	791	819		58.7	2.49 [1.54, 4.04]

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Study	Pomeroy n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
Total events: 49 (Pomeroy), 20 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect z=3.72 p=0.0002					
04 Post operative temperature > 38 C without hospitalisation					
Sitompul 1984	3/197	1/98		3.1	1.45 [0.18, 11.77]
Subtotal (95% CI)	197	98		3.1	1.45 [0.18, 11.77]
Total events: 3 (Pomeroy), 1 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.35 p=0.7					
Total (95% CI)	2570	2555		100.0	1.58 [1.09, 2.28]
Total events: 71 (Pomeroy), 46 (Coagulation)					
Test for heterogeneity chi-square=8.85 df=3 p=0.03 I^2 =66.1%					
Test for overall effect z=2.42 p=0.02					

Analysis 02.06. Comparison 02 Modified Pomeroy versus electrocoagulation, Outcome 06 Technical failures

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 02 Modified Pomeroy versus electrocoagulation

Outcome: 06 Technical failures

Study	Pomeroy n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
× Sitompul 1984	0/1	0/1		0.0	Not estimable
× WHO 1982	0/1	0/1		0.0	Not estimable
Total (95% CI)	2	2		0.0	Not estimable
Total events: 0 (Pomeroy), 0 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					

Analysis 02.08. Comparison 02 Modified Pomeroy versus electrocoagulation, Outcome 08 Failure rate, total

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 02 Modified Pomeroy versus electrocoagulation

Outcome: 08 Failure rate, total

Study	Pomeroy n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Failure rate, total					
Sitompul 1984	1/197	0/98		100.0	4.47 [0.07, 286.78]
Total (95% CI)	197	98		100.0	4.47 [0.07, 286.78]
Total events: 1 (Pomeroy), 0 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.71 p=0.5					

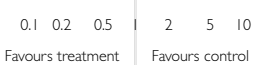
Analysis 02.09. Comparison 02 Modified Pomeroy versus electrocoagulation, Outcome 09 Failure rate, details

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 02 Modified Pomeroy versus electrocoagulation

Outcome: 09 Failure rate, details

Study	Pomeroy n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Failure rate =< 1 year, total					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Pomeroy), 0 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
02 Failure rate =< 1 year, extrauterine pregnancy					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Pomeroy), 0 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
03 Failure rate > 1 year, total					
Sitompul 1984	1/197	0/98		100.0	4.47 [0.07, 286.78]
Subtotal (95% CI)	197	98		100.0	4.47 [0.07, 286.78]
Total events: 1 (Pomeroy), 0 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.71 p=0.5					
04 Failure rate > 1 year, extrauterine pregnancy					
Subtotal (95% CI)	0	0		0.0	Not estimable



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Study	Pomeroy n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
Total events: 0 (Pomeroy), 0 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
Total (95% CI)	197	98		100.0	4.47 [0.07, 286.78]
Total events: 1 (Pomeroy), 0 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.71 p=0.5					

Analysis 02.10. Comparison 02 Modified Pomeroy versus electrocoagulation, Outcome 10 Operative time

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 02 Modified Pomeroy versus electrocoagulation

Outcome: 10 Operative time

Study	Pomeroy N Mean(SD)	Coagulation N Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Total (95% CI)	0	0		0.0	Not estimable
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					

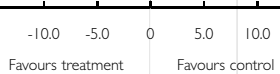
Analysis 02.11. Comparison 02 Modified Pomeroy versus electrocoagulation, Outcome 11 Hospital stay more 24 h

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 02 Modified Pomeroy versus electrocoagulation

Outcome: 11 Hospital stay more 24 h

Study	Pomeroy N Mean(SD)	Coagulation N Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Total (95% CI)	0	0		0.0	Not estimable
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					



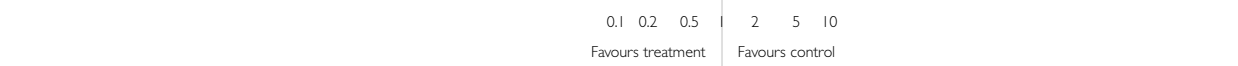
Analysis 02.12. Comparison 02 Modified Pomeroy versus electrocoagulation, Outcome 12 Complaints

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 02 Modified Pomeroy versus electrocoagulation

Outcome: 12 Complaints

Study	Pomeroy n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Post operative pain, < 24 h					
Sitompul 1984	90/197	15/98		16.3	3.75 [2.26, 6.21]
WHO 1982	120/791	30/819		36.9	3.90 [2.79, 5.46]
Subtotal (95% CI)	988	917		53.3	3.85 [2.91, 5.10]
Total events: 210 (Pomeroy), 45 (Coagulation)					
Test for heterogeneity chi-square=0.02 df=1 p=0.90 I^2 =0.0%					
Test for overall effect z=9.45 p<0.00001					
02 Post operative analgesic use					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Pomeroy), 0 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
03 Persistent pain at follow-up visit					
WHO 1982	100/791	96/819		46.7	1.09 [0.81, 1.47]
Subtotal (95% CI)	791	819		46.7	1.09 [0.81, 1.47]
Total events: 100 (Pomeroy), 96 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.56 p=0.6					
Total (95% CI)	1779	1736		100.0	2.14 [1.74, 2.62]
Total events: 310 (Pomeroy), 141 (Coagulation)					
Test for heterogeneity chi-square=36.58 df=2 p=<0.0001 I^2 =94.5%					
Test for overall effect z=7.28 p<0.00001					



Analysis 02.14. Comparison 02 Modified Pomeroy versus electrocoagulation, Outcome 14 Women's satisfaction

Women's satisfaction

Study

Analysis 02.15. Comparison 02 Modified Pomeroy versus electrocoagulation, Outcome 15 Surgeon's satisfaction

Surgeon's satisfaction
Study

Analysis 03.02. Comparison 03 Tubal ring versus electrocoagulation, Outcome 02 Major morbidity, total

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 03 Tubal ring versus electrocoagulation

Outcome: 02 Major morbidity, total

Study	Ring n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Major morbidity, total					
Aranda 1976	0/147	1/151		100.0	0.14 [0.00, 7.01]
× Koetsawang 1978	0/148	0/150		0.0	Not estimable
Total (95% CI)	295	301		100.0	0.14 [0.00, 7.01]
Total events: 0 (Ring), 1 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.99 p=0.3					

Analysis 03.03. Comparison 03 Tubal ring versus electrocoagulation, Outcome 03 Major morbidity, details

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 03 Tubal ring versus electrocoagulation

Outcome: 03 Major morbidity, details

Study	Ring n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Procedure related injuries requiring additional operation or blood transfusion					
Aranda 1976	0/147	1/151		100.0	0.14 [0.00, 7.01]
Subtotal (95% CI)	147	151		100.0	0.14 [0.00, 7.01]
Total events: 0 (Ring), 1 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.99 p=0.3					
02 Re-hospitalisation as a consequence of operation					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Ring), 0 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					

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Study	Ring n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
Total (95% CI)	147	151		100.0	0.14 [0.00, 7.01]
Total events: 0 (Ring), 1 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.99 p=0.3					

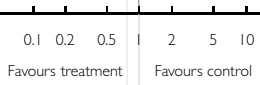
Analysis 03.04. Comparison 03 Tubal ring versus electrocoagulation, Outcome 04 Minor morbidity, total

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 03 Tubal ring versus electrocoagulation

Outcome: 04 Minor morbidity, total

Study	Ring n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Minor morbidity, total					
Aranda 1976	16/147	16/151		80.7	1.03 [0.50, 2.14]
Koetsawang 1978	3/148	4/150		19.3	0.76 [0.17, 3.38]
Total (95% CI)	295	301		100.0	0.97 [0.50, 1.87]
Total events: 19 (Ring), 20 (Coagulation)					
Test for heterogeneity chi-square=0.13 df=1 p=0.72 I^2 =0.0%					
Test for overall effect z=0.09 p=0.9					



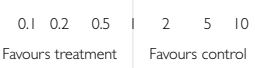
Analysis 03.05. Comparison 03 Tubal ring versus electrocoagulation, Outcome 05 Minor morbidity, details

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 03 Tubal ring versus electrocoagulation

Outcome: 05 Minor morbidity, details

Study	Ring n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Procedure related injuries with no additional operation					
Aranda 1976	1/147	1/151		5.3	1.03 [0.06, 16.51]
Koetsawang 1978	2/148	3/150		13.2	0.68 [0.12, 3.95]
Subtotal (95% CI)	295	301		18.5	0.76 [0.17, 3.38]
Total events: 3 (Ring), 4 (Coagulation)					
Test for heterogeneity chi-square=0.06 df=1 p=0.80 I^2 =0.0%					
Test for overall effect z=0.36 p=0.7					
02 Urogenital infections					
Aranda 1976	2/146	2/150		10.6	1.03 [0.14, 7.37]
Subtotal (95% CI)	146	150		10.6	1.03 [0.14, 7.37]
Total events: 2 (Ring), 2 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.03 p=1					
03 Wound infection					
Aranda 1976	10/146	11/150		52.4	0.93 [0.38, 2.25]
Subtotal (95% CI)	146	150		52.4	0.93 [0.38, 2.25]
Total events: 10 (Ring), 11 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.16 p=0.9					
04 Post operative temperature > 38 C without hospitalisation					
Aranda 1976	3/146	2/150		13.2	1.54 [0.26, 9.01]
Koetsawang 1978	1/148	1/150		5.3	1.01 [0.06, 16.28]
Subtotal (95% CI)	294	300		18.5	1.37 [0.31, 6.06]
Total events: 4 (Ring), 3 (Coagulation)					
Test for heterogeneity chi-square=0.06 df=1 p=0.80 I^2 =0.0%					
Test for overall effect z=0.41 p=0.7					
Total (95% CI)	881	901		100.0	0.97 [0.51, 1.85]
Total events: 19 (Ring), 20 (Coagulation)					
Test for heterogeneity chi-square=0.44 df=5 p=0.99 I^2 =0.0%					
Test for overall effect z=0.09 p=0.9					



Analysis 03.06. Comparison 03 Tubal ring versus electrocoagulation, Outcome 06 Technical failures, total

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 03 Tubal ring versus electrocoagulation

Outcome: 06 Technical failures, total

Study	Ring n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
Aranda 1976	2/147	1/151		59.9	2.01 [0.21, 19.48]
Koetsawang 1978	2/148	0/150		40.1	7.54 [0.47, 121.13]
Total (95% CI)	295	301		100.0	3.42 [0.59, 19.81]

Total events: 4 (Ring), 1 (Coagulation)

Test for heterogeneity chi-square=0.52 df=1 p=0.47 I^2 =0.0%

Test for overall effect z=1.37 p=0.2

Analysis 03.07. Comparison 03 Tubal ring versus electrocoagulation, Outcome 07 Technical dificulties

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 03 Tubal ring versus electrocoagulation

Outcome: 07 Technical dificulties

Study	Ring n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
Aranda 1976	0/147	3/151		100.0	0.14 [0.01, 1.33]
Total (95% CI)	147	151		100.0	0.14 [0.01, 1.33]

Total events: 0 (Ring), 3 (Coagulation)

Test for heterogeneity: not applicable

Test for overall effect z=1.71 p=0.09

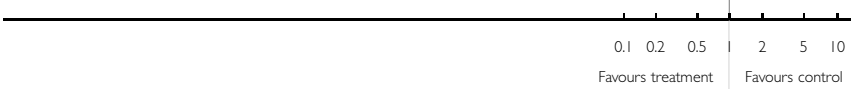
Analysis 03.08. Comparison 03 Tubal ring versus electrocoagulation, Outcome 08 Failure rate, total

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 03 Tubal ring versus electrocoagulation

Outcome: 08 Failure rate, total

Study	Ring n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Failure rate, total					
× Koetsawang 1978	0/80	0/80		0.0	Not estimable
Total (95% CI)	80	80		0.0	Not estimable
Total events: 0 (Ring), 0 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					



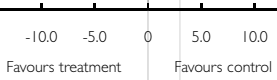
Analysis 03.10. Comparison 03 Tubal ring versus electrocoagulation, Outcome 10 Operative time

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 03 Tubal ring versus electrocoagulation

Outcome: 10 Operative time

Study	Ring N	Ring Mean(SD)	Coagulation N	Coagulation Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
× Koetsawang 1978	148	6.50 (0.00)	150	6.80 (0.00)		0.0	Not estimable
Total (95% CI)	148		150			0.0	Not estimable
Test for heterogeneity: not applicable							
Test for overall effect: not applicable							



Analysis 03.11. Comparison 03 Tubal ring versus electrocoagulation, Outcome 11 Hospital stay more 24 h

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 03 Tubal ring versus electrocoagulation

Outcome: 11 Hospital stay more 24 h

Study	Ring N Mean(SD)	Coagulation N Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Total (95% CI)	0	0		0.0	Not estimable
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					

Analysis 03.12. Comparison 03 Tubal ring versus electrocoagulation, Outcome 12 Complaints

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 03 Tubal ring versus electrocoagulation

Outcome: 12 Complaints

Study	Ring n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Post operative pain, < 24 h					
Aranda 1976	47/147	29/151		26.7	1.95 [1.16, 3.29]
Koetsawang 1978	78/148	24/150		31.6	5.08 [3.15, 8.19]
Subtotal (95% CI)	295	301		58.4	3.28 [2.31, 4.66]
Total events: 125 (Ring), 53 (Coagulation)					
Test for heterogeneity chi-square=7.03 df=1 p=0.008 I^2 =85.8%					
Test for overall effect z=6.62 p<0.00001					
02 Post operative analgesic use					
Aranda 1976	16/147	7/151		10.0	2.40 [1.03, 5.61]
Subtotal (95% CI)	147	151		10.0	2.40 [1.03, 5.61]
Total events: 16 (Ring), 7 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect z=2.02 p=0.04					
03 Persistent pain at follow-up visit					
Aranda 1976	4/146	2/150		2.8	2.03 [0.40, 10.18]
Koetsawang 1978	45/148	41/150		28.9	1.16 [0.70, 1.91]
Subtotal (95% CI)	294	300		31.6	1.22 [0.76, 1.97]
Total events: 49 (Ring), 43 (Coagulation)					
Test for heterogeneity chi-square=0.42 df=1 p=0.52 I^2 =0.0%					

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Study	Ring n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
Test for overall effect z=0.81 p=0.4					
Total (95% CI)	736	752		100.0	2.32 [1.78, 3.04]
Total events: 190 (Ring), 103 (Coagulation)					
Test for heterogeneity chi-square=18.13 df=4 p=0.001 I^2 =77.9%					
Test for overall effect z=6.15 p<0.00001					

Analysis 03.13. Comparison 03 Tubal ring versus electrocoagulation, Outcome 13 Menstrual irregularities

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 03 Tubal ring versus electrocoagulation

Outcome: 13 Menstrual irregularities

Study	Ring n/N	Coagulation n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
Aranda 1976	52/146	57/150		100.0	0.90 [0.56, 1.45]
Total (95% CI)	146	150		100.0	0.90 [0.56, 1.45]
Total events: 52 (Ring), 57 (Coagulation)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.42 p=0.7					

Analysis 03.14. Comparison 03 Tubal ring versus electrocoagulation, Outcome 14 Women's satisfaction

Women's satisfaction

Study		
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Analysis 03.15. Comparison 03 Tubal ring versus electrocoagulation, Outcome 15 Surgeon's satisfaction

Surgeon's satisfaction

Study	Ring	Coagulation
Koetsawang 1978	Positive	Negative

Analysis 04.04. Comparison 04 Modified Pomeroy versus Filshie clip, Outcome 04 Minor morbidity, total

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 04 Modified Pomeroy versus Filshie clip

Outcome: 04 Minor morbidity, total

Study	Pomeroy n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Minor morbidity, total					
Yan 1990	2/97	0/96		100.0	7.39 [0.46, 119.01]
Total (95% CI)	97	96		100.0	7.39 [0.46, 119.01]
Total events: 2 (Pomeroy), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=1.41 p=0.2					

Analysis 04.05. Comparison 04 Modified Pomeroy versus Filshie clip, Outcome 05 Minor morbidity, details

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 04 Modified Pomeroy versus Filshie clip

Outcome: 05 Minor morbidity, details

Study	Pomeroy n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Procedure related injuries with no additional operation					
Yan 1990	2/97	0/96		100.0	7.39 [0.46, 119.01]
Subtotal (95% CI)	97	96		100.0	7.39 [0.46, 119.01]
Total events: 2 (Pomeroy), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=1.41 p=0.2					
02 Urogenital infections					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Pomeroy), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
03 Wound infection					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Pomeroy), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
04 Post operative temperature > 38 C without hospitalisation					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Pomeroy), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
Total (95% CI)	97	96		100.0	7.39 [0.46, 119.01]
Total events: 2 (Pomeroy), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=1.41 p=0.2					

Analysis 04.08. Comparison 04 Modified Pomeroy versus Filshie clip, Outcome 08 Failure rate, total

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 04 Modified Pomeroy versus Filshie clip

Outcome: 08 Failure rate, total

Study	Pomeroy n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Failure rate, total					
Yan 1990	1/70	0/78		100.0	8.28 [0.16, 419.87]
Total (95% CI)	70	78		100.0	8.28 [0.16, 419.87]
Total events: 1 (Pomeroy), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=1.06 p=0.3					

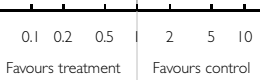
Analysis 04.09. Comparison 04 Modified Pomeroy versus Filshie clip, Outcome 09 Failure rate, details

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 04 Modified Pomeroy versus Filshie clip

Outcome: 09 Failure rate, details

Study	Pomeroy n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Failure rate =< 1 year, total					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Pomeroy), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
02 Failure rate =< 1 year, extrauterine pregnancy					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Pomeroy), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
03 Failure rate > 1 year, total					
Yan 1990	1/70	0/78		100.0	8.28 [0.16, 419.87]
Subtotal (95% CI)	70	78		100.0	8.28 [0.16, 419.87]
Total events: 1 (Pomeroy), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=1.06 p=0.3					
04 Failure rate > 1 year, extrauterine pregnancy					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Pomeroy), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
Total (95% CI)	70	78		100.0	8.28 [0.16, 419.87]
Total events: 1 (Pomeroy), 0 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=1.06 p=0.3					



Analysis 04.10. Comparison 04 Modified Pomeroy versus Filshie clip, Outcome 10 Operative time

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 04 Modified Pomeroy versus Filshie clip

Outcome: 10 Operative time

Study	Pomeroy N Mean(SD)	Clip N Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Total (95% CI)	0	0		0.0	Not estimable
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					

Analysis 04.11. Comparison 04 Modified Pomeroy versus Filshie clip, Outcome 11 Hospital stay more 24 h

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 04 Modified Pomeroy versus Filshie clip

Outcome: 11 Hospital stay more 24 h

Study	Pomeroy N Mean(SD)	Clip N Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Total (95% CI)	0	0		0.0	Not estimable
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					

Analysis 04.13. Comparison 04 Modified Pomeroy versus Filshie clip, Outcome 13 Menstrual irregularities

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 04 Modified Pomeroy versus Filshie clip

Outcome: 13 Menstrual irregularities

Study	Pomeroy n/N	Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
Yan 1990	12/69	6/77		100.0	2.42 [0.90, 6.47]
Total (95% CI)	69	77		100.0	2.42 [0.90, 6.47]
Total events: 12 (Pomeroy), 6 (Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=1.76 p=0.08					

Analysis 04.14. Comparison 04 Modified Pomeroy versus Filshie clip, Outcome 14 Women's satisfaction

Women's satisfaction

Study

Analysis 04.15. Comparison 04 Modified Pomeroy versus Filshie clip, Outcome 15 Surgeon's satisfaction

Surgeon's satisfaction

Study

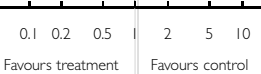
Analysis 05.04. Comparison 05 Hulka-Clemens versus Filshie clip, Outcome 04 Minor morbidity, total

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 05 Hulka-Clemens versus Filshie clip

Outcome: 04 Minor morbidity, total

Study	H Clip n/N	F Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Minor morbidity, total					
Toplis 1988	0/95	1/102		100.0	0.14 [0.00, 7.32]
Total (95% CI)	95	102		100.0	0.14 [0.00, 7.32]
Total events: 0 (H Clip), 1 (F Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.97 p=0.3					



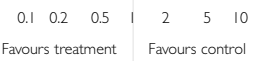
Analysis 05.05. Comparison 05 Hulka-Clemens versus Filshie clip, Outcome 05 Minor morbidity, details

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 05 Hulka-Clemens versus Filshie clip

Outcome: 05 Minor morbidity, details

Study	H Clip n/N	F Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Procedure related injuries with no additional operation					
Toplis 1988	0/95	1/102		100.0	0.14 [0.00, 7.32]
Subtotal (95% CI)	95	102		100.0	0.14 [0.00, 7.32]
Total events: 0 (H Clip), 1 (F Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.97 p=0.3					
02 Urogenital infections					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (H Clip), 0 (F Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
03 Wound infection					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (H Clip), 0 (F Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
04 Post operative temperature > 38 C without hospitalisation					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (H Clip), 0 (F Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
Total (95% CI)	95	102		100.0	0.14 [0.00, 7.32]
Total events: 0 (H Clip), 1 (F Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.97 p=0.3					



Analysis 05.07. Comparison 05 Hulka-Clemens versus Filshie clip, Outcome 07 Technical dificulties

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 05 Hulka-Clemens versus Filshie clip

Outcome: 07 Technical dificulties

Study	H Clip n/N	F Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
Toplis 1988	16/95	9/102		100.0	2.05 [0.89, 4.75]
Total (95% CI)	95	102		100.0	2.05 [0.89, 4.75]
Total events: 16 (H Clip), 9 (F Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=1.69 p=0.09					

Analysis 05.10. Comparison 05 Hulka-Clemens versus Filshie clip, Outcome 10 Operative time

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 05 Hulka-Clemens versus Filshie clip

Outcome: 10 Operative time

Study	H Clip N	H Clip Mean(SD)	F Clip N	F Clip Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Toplis 1988	95	8.80 (3.00)	102	8.10 (2.20)		100.0	0.70 [-0.04, 1.44]
Total (95% CI)	95		102			100.0	0.70 [-0.04, 1.44]
Test for heterogeneity: not applicable							
Test for overall effect z=1.86 p=0.06							

Analysis 05.11. Comparison 05 Hulka-Clemens versus Filshie clip, Outcome 11 Hospital stay more 24 h

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 05 Hulka-Clemens versus Filshie clip

Outcome: 11 Hospital stay more 24 h

Study	H Clip N Mean(SD)	F Clip N Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Total (95% CI)	0	0		0.0	Not estimable
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					

Analysis 05.12. Comparison 05 Hulka-Clemens versus Filshie clip, Outcome 12 Complaints

Review: Techniques for the interruption of tubal patency for female sterilisation

Comparison: 05 Hulka-Clemens versus Filshie clip

Outcome: 12 Complaints

Study	H Clip n/N	F Clip n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Post operative pain, < 24 h					
Toplis 1988	56/95	46/102		100.0	1.74 [0.99, 3.03]
Subtotal (95% CI)	95	102		100.0	1.74 [0.99, 3.03]
Total events: 56 (H Clip), 46 (F Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=1.94 p=0.05					
02 Post operative analgesic use					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (H Clip), 0 (F Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
03 Persistent pain at follow-up visit					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (H Clip), 0 (F Clip)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
Total (95% CI)	95	102		100.0	1.74 [0.99, 3.03]
Total events: 56 (H Clip), 46 (F Clip)					
Test for heterogeneity: not applicable					
Test for overall effect z=1.94 p=0.05					

Analysis 05.14. Comparison 05 Hulka-Clemens versus Filshie clip, Outcome 14 Women's satisfaction

Women's satisfaction

Study	.	.	.	.	.

Analysis 05.15. Comparison 05 Hulka-Clemens versus Filshie clip, Outcome 15 Surgeon's satisfaction

Surgeon's satisfaction

Study	H Clip	F Clip
Toplis 1988	Negative	Positive