Treatment, failures and complications of ectopic pregnancy: changes over a 20 year period

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Data from all 225 women operated on for ectopic pregnancy in 1992–1994 at Sahlgrenska University Hospital were collected and compared with three previous cross-sectional investigations from our hospital (1975–1979, 1981–1982 and 1986–1987) in order to evaluate the extent to which surgical treatment and post-operative complications have changed over a 20 year period. Laparoscopic surgery, which was not possible in the 1970s, was used in almost 85% of the ectopic pregnancies in 1992–1994. Conservative treatment was still the most frequently used technique. The complication rate was 1.2% in 1975–1979 when only laparotomies were carried out. After the introduction of laparoscopic surgery (1986–1987), the complication rate rose significantly (7.3%) and continued to increase even when this procedure was established as routine (14.2% in 1992–1994). Post-operative complications were most frequent after conservative laparoscopic surgery (24.4%) while there were no complications after laparotomies. In spite of increasing complication rates the frequency of patients in pre-shock, as well as the proportion of patients with heavy intra-abdominal bleeding and tubal rupture, decreased over time.

Key words: complications/ectopic pregnancy/second intervention/surgery/treatment

Introduction

The first report on laparoscopic surgery for ectopic pregnancy was that of Bruhat et al. in 1980. Since then, the technical developments have been substantial and today the technique includes both radical treatment and various conservative pharmacological modalities (Pouly et al., 1986; Mecke et al., 1989; Lindblom et al., 1990; Lang et al., 1992). Laparoscopic surgery has been reported to have several short-term benefits, such as shorter hospitalization times and shorter convalescence periods in comparison with laparotomy (Vermesh et al., 1989; Lundorff et al., 1991a; Murphy et al., 1992). Moreover, laparoscopic surgery has proved to be more economical (Gray et al., 1995).

The prerequisite for laparoscopic surgery was the development of new diagnostic modalities, including serum human chorionic gonadotrophin (HCG) (Lindblom et al., 1989; Shepherd et al., 1990) and transvaginal ultrasound (Neiger et al., 1989; Timor-Tritsch et al., 1989) which have contributed to earlier diagnosis of ectopic pregnancy. It is therefore suggested that the proportion of patients with tubal rupture, heavy intra-abdominal bleeding and pre-shock/shock should have decreased, owing to earlier diagnosis. It is also suggested that laparoscopic treatment would imply a decrease in complication rates.

The aim of this investigation was to clarify changes in surgical treatment of patients suffering from ectopic pregnancy in Goteborg, Sweden, during the last two decades and to analyse whether new techniques and treatment modalities have entailed changes in complication rates.

Materials and methods

Between 1992 and 1994 a total of 225 patients were operated on for ectopic pregnancy at Sahlgrenska University Hospital. The medical records of all these patients were retrospectively scrutinized. Surgical procedures and post-operative complications were registered in pre-formed protocols. The treatment procedures were thereafter compared with the surgical management of ectopic pregnancies from our hospital from three earlier time periods (1975–1979, 1981–1982 and 1986–1987). Data on surgical procedures from these periods have previously been reported in studies and include 328, 205 and 178 ectopic pregnancies respectively (Thorburn et al., 1983, 1988; Lundorff et al., 1991b).

Laparoscopic surgery for ectopic pregnancy was introduced in 1985 at our hospital and until 1990 the performance was restricted to a few specially trained surgeons. Before 1988 only conservative laparoscopic procedures were performed and inclusion criteria for laparoscopic treatment were: (i) pre-operative serum HCG <10 000 IU/l; (ii) ectopic gestation <4 cm in diameter; and (iii) no rupture of the tube. Thereafter no such restrictions were required for laparoscopic surgery and radical procedures were also introduced. Before 1989, patients with post-operative bleeding and/or persistent trophoblast (PT) were subjected to reoperation as the only possible intervention. In 1989 low-dose oral methotrexate (MTX) was introduced as a second line therapy in non-symptomatic patients with persistent trophoblast, as an alternative to a second surgical procedure (Bengtsson et al., 1992).

Post-operative complications have not previously been reported from the three earlier time periods. Medical records from the 328 patients in 1975–1979, when only laparotomies were performed and from the 178 patients in 1986–1987, when laparoscopic surgery was first introduced, were thus rescrutinized to identify patients with complications.

Statistical analysis

To study changes over more than two time periods Mantel–Haenszel \( \chi^2 \) test was used for trend in contingency table. For comparison of proportions between groups, Fisher’s exact test was used (Bradley, 1968).
Table I. Surgical procedures performed in the different study periods

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Results

Conservative versus radical surgery

The distribution of the various surgical methods and techniques performed during all the time periods can be seen in Table I. Conservative procedures are defined as expressio ovi, salpingostomies and local pharmacological injections of prostaglandin F$_{2\alpha}$ or hypertonic glucose solution. Radical procedures are defined as tubal resections, salpingectomies and salpingo-ophorectomies. A miscellaneous procedure is defined as a procedure not including tubal surgery, e.g. evacuation of a haematoma in the Pouch of Douglas or resection of the uterus corner in cases of intramural pregnancy.

The proportions of procedures performed by conservative surgery decreased significantly ($P < 0.01$) from 62% (1975–1979) to 50% (1981–1982), then increased significantly ($P < 0.001$) up to 77% (1986–1987) and later decreased significantly ($P < 0.001$) to 61% (1992–1994) (Figure 1). There was no significant trend of the proportions of conservative procedures over the total period.

The proportion of procedures performed by radical surgery increased significantly ($P = 0.01$) from 36% (1975–1979) to 47% (1981–1982), then decreased significantly ($P < 0.001$) to 22% (1986–1987) and later increased significantly ($P = 0.05$) to 31% (1992–1994) (Figure 1). A trend analysis over the total time period showed a significant ($P < 0.05$) decrease in the proportion of radical procedures.

Surgical procedures: laparoscopy versus laparotomy

The frequency of laparoscopic surgery versus laparotomy is demonstrated in Figure 2. In 1986–1987 only conservative
laparoscopic procedures were performed while in 1992–1994 30% of the laparoscopic procedures were radical. Over time there was a decrease of procedures performed using laparotomy ($P < 0.0001$) and an increase of laparoscopic surgery ($P < 0.0001$). From no laparoscopic procedures in 1975–1979 and 1981–1982 the percentage rose to 84.5% in 1992–1994.

**Per-operative findings**

With available information from the previous studies, the following was established: in 1992–1994, 7.1% of the patients suffered from pre-shock/shock, in comparison with 19.8% in 1975–1979 ($P < 0.001$). In 1992–1994, bleeding of $>500$ ml was observed in 15.6% of the cases, in comparison with 29.3% in 1981–1982 ($P < 0.001$). In 1992–1994, tubal rupture occurred in 16.9% of the patients, in comparison with 25.9% in 1981–1982 ($P < 0.05$) and 22.5% in 1986–1987 (not significant). Among laparoscopic salpingostomies in 1992–1994, the frequency of tubal rupture was 6.8%, compared with zero (0%) in 1986–1987.

**Failures and complications**

Failures are defined as procedures requiring a second intervention (reoperation or MTX treatment) owing to PT. Complications are defined as all procedures requiring a second intervention, owing to PT or bleeding. Except for two cases in 1992–1994 (reoperations after laparoscopic salpingectomies) the failure rates and the complication rates are clinically estimated to be identical.

In 1975–1979, the complication rate was 1.2% ($n = 4/328$), and complications were seen only after conservactive procedures. The complication rate rose to 7.3% ($n = 13/178$) in 1986–1987 ($P < 0.05$) and increased further to 14.2% ($n = 32/225$) in 1992–1994 ($P < 0.001$) (Table II).

Complications after laparoscopy/laparotomy, conservative/radical and after laparoscopic conservative/radical procedures in the two time periods 1986–1987 (when laparoscopic surgery was introduced) and 1992–1994 (when laparoscopic surgery was established) are shown in Table III. The complication rates were significantly higher after laparoscopy than after laparotomy. Complication rates were also significantly higher after conservative than after radical procedures in 1992–1994.

Laparoscopic conservative surgery had a significantly higher complication rate than laparoscopic radical surgery. The two reoperations after laparoscopic radical surgery in 1992–1994 were necessary owing to bleeding, from the epigastric artery in one case and from the uterine corner in the other. The complication rate did not change after laparoscopic surgery between 1986–1987 and 1992–1994 (19.1 versus 17.1%; not significant), while the complication rate after conservative surgery increased from 9.5 to 21.9% ($P < 0.01$).

Complication rates after laparotomy as well as after radical procedures were low in both periods (not significant).

The complication rate after laparoscopic conservative surgery tended to increase from 1986–1987 to 1992–1994 (19.1 and 24.4%), although not significantly. Radical laparoscopic surgery was not performed in 1986–1987 and the complication rate in 1992–1994 was low (3.9%).

Among different laparoscopic procedures, there was also a tendency towards an increased complication rate after both salpingostomy (19.4 versus 23.3%) and pharmacological treatment (18.8 versus 31.6%), although it was not significant.

**Discussion**

Over the period of the study, laparoscopic surgery was introduced at our clinic in 1986–1987 and established in 1992–1994 when the majority of the patients (84.5%) were treated using this technique. Previous randomized studies on ectopic pregnancy from other clinics of laparoscopy versus laparotomy have not shown significant differences in complication rates (Vermesh et al., 1989; Murphy et al., 1992). However, a tendency towards a higher failure rate in cases treated using laparoscopy was noted in a randomized study from our clinic (12.7 versus 3.5%) (Lundorff et al., 1991b). Moreover, in non-randomized series, the failure rate after laparoscopic salpingostomies was reported to be higher than after salpingostomies by laparotomy (15.5 versus 1.8%) (Seifer et al., 1993). Since randomized studies only include selected cases, the failure rates cannot be compared with series which include all consecutively-treated ectopic pregnancies, as in our study.
Furthermore, failure rates are defined somewhat differently in various studies and, therefore, are not always comparable.

Conservative procedures were the dominant method during the complete study period, with a peak in 1986–1987. One reason for this could be the introduction of laparoscopic surgery which allowed only conservative procedures at that time. Other reasons could be that subsequent fertility was suggested to be better after conservative surgery (Hallatt, 1986) and that in-vitro fertilization (IVF) was not yet generally available.

Between 1986–1987 and 1992–1994 the use of radical procedures increased. The laparoscopic technique per se had been developed, allowing more radical approaches. Furthermore, a salpingectomy implies several advantages, including a lower risk of PT and a second intervention, and a shorter follow-up period. Another reason for a more radical approach could be the availability of IVF treatment. In our clinic, IVF was introduced at the same time as laparoscopic surgery (Bergh et al., 1995). At this time, there were also recommendations from France suggesting radical treatment in selected cases, based on a scoring system for future fertility (Pouly et al., 1991). It is not possible to state whether the high percentage (29.7%) of radical laparoscopic procedures performed in our clinic today is a consequence of using this scoring system or whether it is due to the fact that salpingectomy is technically easier to perform.

After the introduction of laparoscopic surgery we had expected a temporarily somewhat higher complication rate, attributable to this completely new technique. However, we also expected that with increased experience, the complication rate after laparoscopic surgery would decline to a level hopefully not higher than for laparatomies only. We also expected that, with fewer patients operated on in preshock/shock, or with heavy intra-abdominal bleeding, or tubal rupture, the overall complication rate would decline.

In line with our expectations, the overall complication rate increased when laparoscopic surgery was introduced, but it continued to increase even when the technique was well established. The complication rates after the various laparoscopic procedures did not, however, increase significantly between the periods. The fact that the majority of operations were performed by laparoscopy and that the main procedures were conservative is suggested as explaining the doubled complication rate (from 7.3 to 14.2%).

The failure rate after laparoscopic conservative surgery is unacceptably high (24.4%). There are multifactorial explanations: increased numbers of surgeons with differing experience of laparoscopic surgery, no upper limit of serum HCG value and acceptance of tubal rupture. Therefore, previous results of a 5% risk for PT (Pouly et al., 1986) after laparoscopic conservative treatment no longer seem to be universally valid.

The very low complication rate and the absence of failures after radical laparoscopic surgery makes it tempting to recommend this mode of treatment for the future, especially in view of recent reports suggesting that radical procedures have economic advantages (Rulin, 1995) with no reduced fertility prospects (Clausen, 1996). The condition of the contralateral tube and the patient’s history seem to be the major factors related to the reproductive outcome after ectopic pregnancy (Dubuisson et al., 1996). With available post-operative IVF treatment it is even more tempting to recommend laparoscopic salpingectomy. However, prospective randomized studies of laparoscopic conservative versus radical surgery which take into account subsequent fertility must first be made. Results from such studies would clarify the issues and enable recommendations concerning the acceptability of radical surgery to be made in clinics where IVF is not available. However, attention must also be paid to the fact that a radical procedure might influence the blood supply to the ovary and reduce the success rate for subsequent IVF treatment (Csemiczky et al., 1995).

There were no complications after radical surgery performed by laparotomy. However, we cannot suggest this mode of treatment as preferable because of all the other advantages associated with laparoscopic surgery, and therefore operative laparoscopy is suggested as the surgical treatment of choice for ectopic pregnancy today (Dubuisson et al., 1996). There is presently a great deal of debate as to whether surgery should still be the preferred mode of treatment for ectopic pregnancy, and it is beyond the scope of this paper to answer that question. High success rates have been reported after MTX treatment of unruptured ectopic pregnancies (Durai et al., 1995). Furthermore, a recent cost analysis of MTX management versus laparoscopic surgery for ectopic pregnancy demonstrated cost savings with the MTX treatment (Yao et al., 1996). However, by calculating success rates of 65.8% for MTX treatment and comparing this with the reported success rates of 92.7% for laparoscopic treatment, a recent study has established that a surgical approach by means of operative laparoscopy should still remain the gold standard (Clasen et al., 1997).

In conclusion, the reported high complication rates after laparoscopic conservative surgery in this study highlight the importance of having more stringent criteria for patient selection and of restriction to skilled surgeons of the use of these procedures.

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References
Management of ectopic pregnancy over 20 years


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