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Abdominal myomectomy for infertility: a comprehensive review

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To obtain estimates of the effect of abdominal myomectomy on infertility, information from studies published in the English language literature between 1982 and 1996 was retrieved. Articles were identified through hand and computerized searches using Medline. A total of 27 trials, all published in peer-reviewed journals, was identified, of which four were excluded from the analysis because of methodological limitations. All studies were non-comparative and only nine were prospective. The sample size was generally limited, the mean number of patients included being 49 and the mean number of infertile subjects 26. All patients were followed for at least 12 months after surgery in 12 studies. The combined estimate of pregnancy rates across prospective studies based on a total of 138 observed subjects was 57% [95% confidence interval (CI), 48–65%]. Time to conception varied from a mean of 8 to 20 months. Survival analysis was used in only three studies, with cumulative rates ranging from 57 to 67% at 1 year, and 63% at 5 years. The overall conception rate among seven prospective studies in which only women with otherwise unexplained infertility were recruited was 61% (95% CI, 51–70%) compared with 38% (95% CI, 20–59%) in two prospective studies that included patients with causes of infertility in addition to myomas (χ^2_1 = 4.25, P = 0.04; mean difference = 23%, 95% CI, 1–43%; OR = 2.47, 95% CI, 1.03–5.94). The conception rate ranged from 58 to 65% in the three studies of women with only intramural and/or subserous fibroids and were respectively 53 and 70% in the two that considered only patients with submucous myomas. Data on recurrence after myomectomy were reported in 13 articles, with rates varying from 4 to 47%. According to the available evidence, slightly less than two-thirds of women with uterine leiomyomas and otherwise unexplained infertility conceived after myomectomy. However, comparison with expectant management is needed before drawing definitive conclusions on the effectiveness of this time-honoured conservative surgical procedure.

Key words: infertility/leiomyomas/overview/reproduction/uterus

Introduction

Disagreement exists on the efficacy of myomectomy for infertility and perplexities may arise when counselling patients. It is an old clinical tenet that fibroids may interfere with gamete transport or blastocyst implantation (see reviews by Vercellini *et al.*, 1992 and Wallach and Vu, 1995) and some authors maintain that myomectomy should be offered to infertile women (Buttram and Snabes, 1992; Hutchins, 1995; Verkauf, 1996; Peacock and Rock, 1996). However, opinions vary widely in the literature, as no definitive demonstration of the causative role of leiomyomas in impeding conception is yet available. When fibroids are entirely or mostly endocavitary, there is a strong rationale supporting the use of surgery, also because menorrhagia is usually an additional presenting symptom (Vercellini *et al.*, 1993). Moreover, completely submucous lesions can be easily removed by hysteroscopy with minimal morbidity and there is general consensus on the efficacy of the procedure (Donnez *et al.*, 1990; Valle, 1990; Corson and Brooks, 1991; Tulandi, 1996a, b). Uncertainty is greater in the case of asymptomatic women with mostly intramural and subserous myomas and otherwise unexplained infertility (Paulson, 1993). In these circumstances, the gynaecologist is often faced with a dilemma regarding correct counselling: should abdominal conservative surgery with its inherent morbidity and risk of adhesion formation be offered, or should expectant management be suggested? The recent possibility of myoma removal at laparoscopy may now tip the balance in favour of surgery to a greater extent than in the past (Dubuisson *et al.*, 1991, 1993, 1995a; Dicker *et al.*, 1996; Donnez *et al.*, 1996; Dubuisson and Chapron, 1996; Nezhat *et al.*, 1996). However, the reduction of morbidity and costs alone should not induce an increase of interventions in the absence of convincing evidence of efficacy in terms of fertility enhancement. Furthermore, the risk of adhesion formation is far from avoided with laparoscopic surgery (Nezhat *et al.*, 1991), and the rupture of pregnant uteri has been observed after laparoscopic myomectomy (Harris, 1992; Dubuisson *et al.*, 1995b, Parker, 1995). For these reasons, we considered it of interest to search for and analyse published data on the topic in the scientific literature of the last 15 years. This time span was chosen because surgery prior to the 1980s may have been performed without respecting several microsurgical principles that can influence reproductive prognosis. The main purpose of the present quantitative review was to assess the overall effect of myomectomy at laparotomy and laparoscopy in terms of postoperative conception rates, and to compare proportions of pregnant women in relation to the absence or presence of additional infertility factors.

Materials and methods

Study identification

We adopted different strategies to identify all English-language medical papers published on fertility after abdominal myomectomy. We con-

ducted a Medline search from January 1982 to December 1996 using the following medical subject heading terms: leiomyomas, myomectomy, uterus, infertility, conservative surgery. We hand searched the main specialist journals from January 1982 to December 1996 (*American Journal of Obstetrics and Gynecology, British Journal of Obstetrics and Gynaecology, Fertility and Sterility, Human Reproduction* (from 1986), and *Obstetrics and Gynecology*), as well as the *Institute for Scientific Information Current Contents/Clinical Medicine* from January 1986 to December 1996. We identified additional reports by systematically reviewing all references from retrieved papers and by consulting gynaecological and surgical textbooks and monographs on uterine leiomyomas published in the last 10 years.

Study selection

Proceedings of scientific meetings were not included. Due to the absence of comparative or controlled studies on this specific topic, we decided to collect data from the available observational studies. Only articles in which the results were presented as proportion of pregnant/non-pregnant women after surgery were considered. Studies were excluded if it was not possible to identify how many patients desired a pregnancy or were infertile and if the follow-up was too short to draw conclusions on postoperative reproductive outcome.

Data extraction

Response to treatment was considered as postoperative conception among previously infertile women independently of pregnancy outcome. Infertility before surgery was considered as otherwise unexplained if there was evidence of patent tubes, ovulation and normal semen analysis. Fibroids were classified as submucous when the uterine cavity was distorted or opened during surgery. Two authors (P.V. and S.M.) abstracted data in an unblinded fashion on standardized forms. An initial screening of the title and abstract of all articles was performed to exclude citations deemed irrelevant by both observers. The year of publication, type of study, clinical characteristics of subjects, and surgical details were recorded independently. The number of women wanting pregnancy at baseline, the duration of follow-up, and the incidence of conception among infertile patients were obtained from individual studies. Data were also collected on recurrence of fibroids and need for re-intervention. Discrepancies between evaluators were identified and resolved by consensus.

Data management

For each study, we calculated the post-surgical conception rate with the respective 95% confidence interval (CI) based on binomial distribution (Gardner and Altman, 1989). A combined estimate of pregnancy rates across prospective studies only was then calculated. Usual 2×2 tables were generated to compare pregnancy outcome in women with and without other causes of infertility in addition to uterine fibroids. Crude numbers were obtained from the authors when results were presented as cumulative rates (Tulandi *et al.*, 1993). Odds ratios (OR) and their 95% CI were calculated using Epi Info 6.0 software (Division of Surveillance and Epidemiology Program Office. Centers for Disease Control and Prevention, Atlanta, Georgia, USA, 1994). Differences between studies were assessed quantitatively using the χ^2 test for heterogeneity.

Results

The initial screening yielded 27 citations for further assessment. Of these, we excluded one because only one woman actively tried to become pregnant (Daniell and Gurley, 1991), one because data on women desiring pregnancy were unclear (Nezhat *et al.*, 1991), and one because of too short a follow-up (1–3 months; Dubuisson *et al.*, 1991). Figures in Smith and Uhlir's study (1990) are presented in tabular form but were not considered in our analysis of pregnancy outcome because there were no infertile patients among women desiring conception in that series. Data on the effect of myomectomy on infertility were extracted from the remaining 23 articles. The main characteristics of the studies and of women undergoing surgery are shown in Table I. All articles were published in peer-reviewed journals; 18 evaluated reproductive outcome only in infertile subjects, and five also in all women wanting children. All studies were non-comparative and only nine were prospective. The sample size was highly variable (from 8 to 148), the mean number of patients included being 49 and the mean number of infertile subjects 26. In most series the mean age at surgery was >30 years. Before myomectomy, fibroids were the only possible cause of infertility in 10 studies, whereas in 12 there were other associated causes. In one article (Chong *et al.*, 1988), this aspect was not clarified. Unfortunately, only scattered data of limited value are available regarding preoperative duration of infertility and spontaneous abortion rate. Operative details are shown in Table II. Myomectomy was always performed at laparotomy with the exception of four studies in which either laparotomy or laparoscopy (Sudik *et al.*, 1996), or laparoscopy alone (Hasson *et al.*, 1992; Dubuisson *et al.*, 1996) or combined with minilaparotomy (Nezhat *et al.*, 1994) was used. Details on number and diameter of removed fibroids were scanty or absent in most articles. In three studies the women had only intramural and/or subserous leiomyomas (Rosenfeld, 1986; Verkauf, 1992; Tulandi *et al.*, 1993) and in two the lesions were always submucosal (Garcia and Tureck, 1984; Reyniak and Corenthal, 1987). The site of the tumours was not specified by Gatti *et al.* (1989), Fayez and Dempsey (1993), Abramovici *et al.* (1994) and Vollenhoven *et al.* (1993). Myomectomy was the only surgical procedure performed in 12 studies, whereas additional interventions on reproductive organs were carried out in the other 11. In 16 studies, intraoperative measures for adhesion reduction were used, mainly dextran and corticosteroids in the earlier series and Interceed® in the more recent ones. Gonadotrophin releasing hormone (GnRH) agonists were prescribed before surgery in some patients in seven studies (Gehlbach *et al.*, 1993; Liu *et al.*, 1993; Vollenhoven *et al.*, 1993; Abramovici *et al.*, 1994; Nezhat *et al.*, 1994; Acien and Quereda, 1996; Sudik *et al.*, 1996). No other preoperative medical treatments were used. Postoperatively, GnRH agonists were given only by Acien and Quereda (1996), and McLaughlin (1982) administered oral contraceptives. The main postoperative results are presented in Table III. All patients were followed for at least 12 months after myomectomy in 12 studies. The duration of follow-up was not reported in three articles dealing with infertile patients (Chong *et al.*, 1988; Gatti *et al.*, 1989; Abramovici *et al.*, 1994). The crude pregnancy rate for all recruited women wanting children independently of infertility status is available for six series and ranged from 12% (Omu and Ehigiegba, 1983) to 67% (Acien and Quereda, 1996). The pregnancy rate relative only to infertile patients is available for all series except that of Smith and Uhlir (1990), and ranged from 10 (Egwuatu, 1989) to 75% (Liu *et al.*, 1993). When heterogeneity among studies was tested, a χ^2_{22}

Table I. Main details of studies on myomectomy and of women undergoing surgery

Source	Origin, year	Type of study	Sample size	Mean age (range)	No. parous	No. with spontaneous abortions	No. infertile	Years of infertility (range)	Infertility factors other than myomas
McLaughlin	USA 1982	prosp	8	(25–33)	NR	NR	5	NR	yes
Berkeley *et al.*	USA 1983	retr	50	NR	23	3	25	NR	yes
Omu and Ehigiegba	Nigeria 1983	retr	72	(<20–50)	32	NR	50	NR	yes
Garcia and Tureck	USA 1984	prosp	17	30.2 (24–34)	1	3	17	>3	no
Rosenfeld	USA 1986	retr	23	34.2 (26–42)	2	6	23	5.2	no (1–16)
Reyniak and Corenthal	USA 1987	prosp	17	33.2 (27–36)	NR	NR	10	NR	no
Chong *et al.*	Singapore 1988	retr	81	33.6	32	NR	25	6.8	NR
Starks	USA 1988	prosp	32	(25–40)	NR	8	32	(5–10)	no
Egwuatu	Nigeria 1989	retr	141	30.2 (20–47)	25	NR	52	NR	yes
Gatti *et al.*	Italy 1989	retr	30	33.3 (26–42)	NR	NR	30	⩾2	yes
Smith and Uhlir	USA 1990	retr	63	35.8 (27–47)	11	10	0	[a]	[a]
Hasson *et al.*	USA 1992	NR	56	37.1 (25–51)	20	30	17	NR	yes
Verkauf	USA 1992	retr	31	NR	NR	2	24	NR	yes
Fayez and Dempsey	USA 1993	retr	148	(25–43)	NR	16	38	NR	no
Gehlbach *et al.*	USA 1993	retr	37	34.0 (27–42)	7	7	37	3.0 (1–19)	yes
Liu *et al.*	Taiwan 1993	prosp	8	31.5 (25–43)	NR	NR	8	(2–7)	no
Tulandi *et al.*	Canada 1993	prosp	26	33.4 ± 1.4 (26–40)	NR	1	26	3.1 ± 0.8	no[b]
Vollenhoven *et al.*	Australia 1993	prosp	13[c]	34.0 (27–42)	NR	NR	13	⩾1.0	no
Abramovici *et al.*	Israel 1994	prosp	10[c]	(24–34)	1	NR	10	>1.5	no
Nezhat *et al.*	USA 1994	retr	57	37.7 (29–46)	NR	NR	14	NR	yes
Sirjusingh *et al.*	Trinidad 1994	retr	103	32.7 (21–42)	29	NR	38[d]	NR	yes[d]
Acien and Quereda	Spain 1996	retr	80	30.9 ± 4.5 (18–43)	23	3	20	4.3 ± 3.2 (1–11)	yes
Dubuisson *et al.*	France 1996	prosp	21	37.4 ± 3.3	NR	NR	21	3.5 ± 3.2 (1–14.5)	yes[e]
Sudik *et al.*	Germany 1996	retr	67	32.0 ± 4.3	NR	NR	67	NR	no

NR = not reported; retr = retrospective; prosp = prospective.
[a]No infertile patients.
[b]Excluding one with bilateral hydrosalpinx.
[c]Including only women who underwent myomectomy.
[d]Fourteen women had no other causes of infertility.
[e]Nine women had no other causes of infertility.

value of 90.53 was found ($P < 0.0001$). This highly statistically significant value was mainly due to differences in the characteristics of evaluated women, especially in terms of multiple causes of infertility in addition to myomas. For example, the low conception rate reported by Omu and Ehigiegba (1983) and Egwuatu (1989) from Nigeria (respectively 12 and 10%) were probably determined by an unusually high prevalence of pelvic inflammatory disease sequelae with tubal distortion and/or occlusion observed at surgery in more than half the patients (respectively 57 and 58%). To limit the introduction of qualitative as well as quantitative heterogeneity in our review, we included only the nine prospective studies in further analyses of the effect of myomectomy on infertility. This substantially reduced heterogeneity to a non-significant level (χ^2_8 7.95, $P = 0.44$). After exclusion of the retrospective reports, the combined estimate of pregnancy rates across studies based on a total of 138 observed subjects was 57% (95% CI, 48–65%). Time to conception varied in the different trials, ranging from a mean of 8 (Starks, 1988; Gehlbach *et al.*, 1993) to 20 months (Berkeley *et al.*, 1983). Survival analysis was used in only three studies, with cumulative

Table II. Operative details of studies on myomectomy

Source	Surgical modality	Type of instruments	No. of myomas (mean)	Diameter of myomas (cm)	Location of myomas	Interventions on reproductive organs other than myomectomy	Measures for adhesion prevention
McLaughlin	LPT	CO_2 laser	NR	1-12	SM, IM, SS	yes	corticosteroid dextran
Berkeley *et al.*	LPT	NR	232	NR	SM, IM, SS	yes	corticosteroid dextran
Omu and Ehigiegba	LPT	NR	1–125	NR	SM, IM, SS	yes	NR
Garcia and Tureck	LPT	NR	NR	NR	SM	no	corticosteroid
Rosenfeld	LPT	NR	NR	3–14	IM, SS	no	corticosteroid dextran
Reyniak and Corenthal	LPT	CO_2 laser	NR	NR	SM	no	dextran
Chong *et al.*	LPT	NR	1–132 (6.9 ± 16.6)	NR	SM, IM, SS	no	NR
Starks	LPT	CO_2 laser	NR	4–18	SM, IM, SS	no	dextran
Egwuatu	LPT	NR	NR	NR	SM, IM, SS	yes	NR
Gatti *et al.*	LPT	MI+ES	NR	3–10	NR	yes	dextran
Smith and Ulhir	LPT	MI+ES	64	NR	SM, IM, SS	yes	dextran
Hasson *et al.*	LPS	CO_2 laser + MI+ES	144	3–16	SM, IM, SS	yes	corticosteroid dextran Interceed® Ringer's lactate antihistamines
Verkauf	LPT	NR	NR	NR	IM, SS	yes	corticosteroid dextran antihistamines
Fayez and Dempsey	LPT	MI+ES	NR	NR	NR	no	Ringer's lactate
Gehlbach *et al.*	LPT	MI+ES	1–17 (3.0)	NR	SM, IM, SS	yes	corticosteroid dextran Interceed® heparin
Liu *et al.*	LPT	NR	NR	⩾3	SM, IM	no	NR
Tulandi *et al.*	LPT	MI+ES	(3.3 ± 1.8)	NR	IM, SS	no	Ringer's lactate
Vollenhoven *et al.*	LPT	NR	(3.1)	NR	NR	no	NR
Abramovici *et al.*	LPT	NR	NR	NR	NR	no	NR
Nezhat *et al.*	LPS + mini LPT	CO_2 laser + ES+MI	NR	NR	SM, IM, SS	yes	Interceed®
Sirjusingh *et al.*	LPT	MI+ES	NR	NR	SM, IM, SS	yes	NR
Acien and Quereda	LPT	MI+ES	198	8.5 ± 3.9 (2–16)	SM, IM, SS	yes	dextran Interceed®
Dubuisson *et al.*	LPS	MI+ES	1–10 (2.2 ± 2.1)	6.2 ± 1.6 (5–10)	SM, IM, SS	no	–
Sudik *et al.*	LPT/ LPS	MI+ES	1–>5	>1	SM, IM, SS	no	dextran Interceed® Ringer's lactate

LPT = laparotomy; LPS = laparoscopy; SM = submucous; IM = intramural; SS = subserous; MI = mechanical instruments; ES = electrosurgery; NR = not reported.

rates ranging from 57% (Gehlbach *et al.*, 1993) to 67% (Tulandi *et al.*, 1993) at 1 year, and 63% at 5 years (Acien and Quereda, 1996). Percentage point estimates of conception with their respective 95% CI for both prospective and retrospective studies are reported in Figures 1 and 2. The overall conception rate among seven prospective studies in which 112 women with otherwise unexplained infertility were recruited was 61% (95% CI, 51–70%) compared with 38% (95% CI, 20–59%) in two prospective studies that included 26 patients with causes of infertility in addition to myomas ($\chi^2_1 = 4.25$, $P = 0.04$; mean difference = 23%, 95% CI, 1–43%; OR = 2.47, 95% CI, 1.03–5.94). The conception rate in the three studies in which women with only intramural and/or subserous fibroids were recruited (Rosenfeld, 1986; Verkauf, 1992; Tulandi *et al.*, 1993) ranged from 58 to 65%, whereas in the two that included only patients with submucous myomas (Garcia and Tureck, 1984; Reyniak and Corenthal, 1987) the conception rates were respectively 53 and 70%. Data on recurrence after myomectomy were reported in 13 articles (Figure 3), with rates varying from 4 (Rosenfeld, 1986; Hasson *et al.*, 1992) to 47% (Gehlbach *et al.*, 1993). Again, we opted not to calculate an average estimate because of qualitative heterogeneity among studies. In fact, the authors did not always specify the length of follow-up and/or the modality of diagnosis of recurrent fibroids (clinical examination, abdominal or vaginal ultrasonography), factors which may greatly influence the outcome of interest. The incidence of

Table III. Main postoperative results of studies on myomectomy

Source	Mean no. and/or range of months of follow-up	Pregnancies among all women wanting children		Pregnancies among infertile women		Mean no. and/or range of months to conception	No. with abortion	Myoma recurrence		Reintervention for myoma	
		no.	%	no.	%			no.	%	no.	%
McLaughlin	2–12	–	–	3/5	60	NR	NR	NR	NR	NR	NR
Berkeley *et al.*	17–127	25/50	50	9/25	36	20	–	3/50	6	4	8
Omu and Ehigiegba	⩾12	8/65	12	6/50	12	NR	–	10/72	14	–	–
Garcia and Tureck	>10	–	–	8/15[a]	53	<36	1	1/17	6	1	6
Rosenfeld	⩾12	–	–	15/23	65	<12	1	1/23	4	1	4
Reyniak and Corenthal	8–26	–	–	7/10	70	8–16	NR	NR	NR	NR	NR
Chong *et al.*	NR	NR	NR	7/25	28	17	3	5/81	8	2	2
Starks	12–36	–	–	20/32	63	8.5	3	NR	NR	NR	NR
Egwuatu	12–48	25/95	26	5/52	10	15.7 2–39	4	13/95	14	13	14
Gatti *et al.*	NR	–	–	13/30	43	<12	3	NR	NR	NR	NR
Smith and Uhlir	NR	16/32	50	–	–	NR	2	4/62	6	3	5
Hasson *et al.*	11 2–36	NR	NR	12/17	71	NR	2	2/56	4	–	–
Verkauf	42 4–112	–	–	14/24	58	NR	NR	5/31	16	2	6
Fayez and Dempsey	⩾12	NR	NR	24/38	63	⩽12	3[b]	NR	NR	NR	NR
Gehlbach *et al.*	⩾12	–	–	19/37	51	8.6	8	15/32	47	4	12
Liu *et al.*	12	–	–	6/8	75	⩽12	0	NR	NR	NR	NR
Tulandi *et al.*	12	–	–	16/25[c]	64	NR	NR	NR	NR	NR	NR
Vollenhoven *et al.*	12	–	–	6/12[d]	50	⩽12	NR	NR	NR	NR	NR
Abramovici *et al.*	NR	–	–	5/10	50	NR	1	NR	NR	NR	NR
Nezhat *et al.*	11 3–24	–	–	4/14	29	6-9	NR	NR	NR	NR	NR
Sirjusingh *et al.*	24–120	34/103	33	14/38	37	NR	5	18/103	17	12	12
Acien and Quereda	77 ± 41 4–144	27/40	67	10/20	50	15.6 ± 13.2	3	7/74	9	6	8
Dubuisson *et al.*	⩾12	–	–	7/21	33	⩽12	1	NR	NR	NR	NR
Sudik *et al.*	6–114	–	–	39/67	58	<12–>36	NR	31/67	46	NR	NR

NR = not reported.
[a]Excluding two infertile women who elected to use contraception.
[b]Of 16 women with recurrent abortion.
[c]Excluding one woman with bilateral hydrosalpinx.
[d]Excluding one lost to follow-up.

re-intervention for recurrent myomas, reported in 12 studies (Table III), was generally low, ranging from 0 (Omu and Ehigiegba, 1983; Hasson *et al.*, 1992) to 14% (Egwuatu, 1989).

Discussion

Several hypotheses have proposed a causal relation between uterine leiomyomas and infertility (Vercellini *et al.*, 1992; Wallach and Vu, 1995) but no definitive demonstration is yet available. Consequently, abdominal myomectomy in women with pregnancy delay is still controversial, with some authors favouring surgery when no other infertility factors are found (Buttram and Reiter, 1981; Rosenfeld, 1986; Verkauf, 1992, 1996; Hutchins, 1995) and others recommending observation (Berkeley *et al.*, 1983; Paulson, 1993; ACOG Technical Bulletin, 1994; Parker, 1995; Peacock and Rock, 1996). A demonstration of the efficacy of abdominal myomectomy for infertility should ideally be based on results of randomized trials with expectant management as a control treatment (Paulson, 1993). Unfortunately, there are not only no randomized controlled trials on the effect of myomectomy but there are no comparative or cohort studies including non-randomized controls either. The quality of the evidence from case series and retrospective reports is poor, raising concerns over the

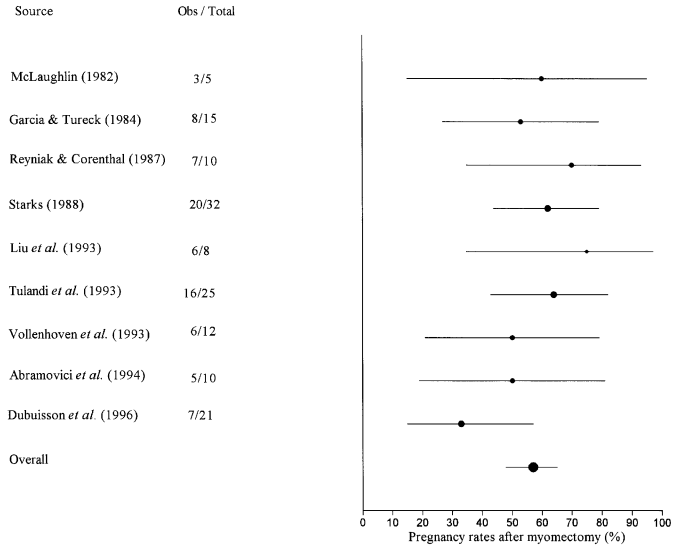

Figure 1. Percentages of conceptions in infertile women after myomectomy in the considered prospective studies. χ^2 for heterogeneity = 7.95, 8 *df*, $P = 0.44$. Circles represent point estimates and horizontal lines 95% confidence intervals. Figures have been rounded up to the next whole number.

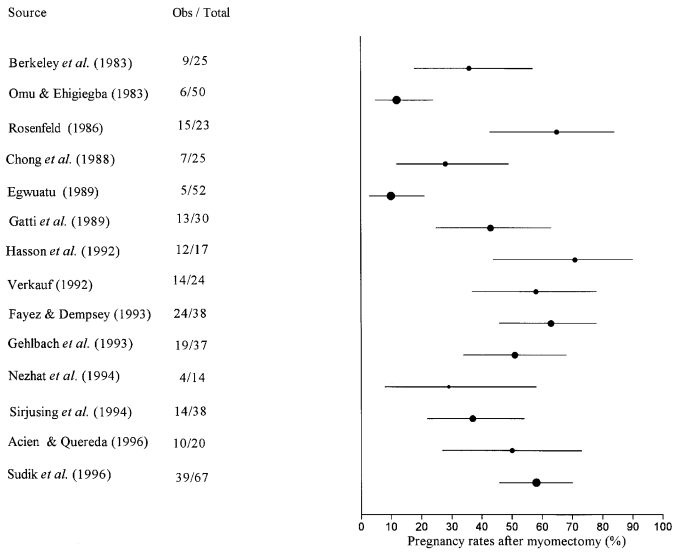

Figure 2. Percentages of conceptions in infertile women after myomectomy in the considered retrospective studies. Circles represent percentage point estimates and horizontal lines 95% confidence intervals. Figures have been rounded up to the next whole number.

potential for bias. Furthermore, duration of infertility, age at surgery, proportion of women with primary versus secondary infertility, prevalence of infertility factors other than myomas as well as length of follow-up varied widely. All these variables might considerably increase clinical heterogeneity between studies. Moreover, socioeconomic characteristics and risk factors for pelvic infections seemed to differ among the various study populations. Publication bias may constitute another potential limitation, especially when considering retrospective studies which are more prone to over-represent optimistic results. For these reasons it was decided to tabulate the results of all identified trials but to limit analyses to the data collected

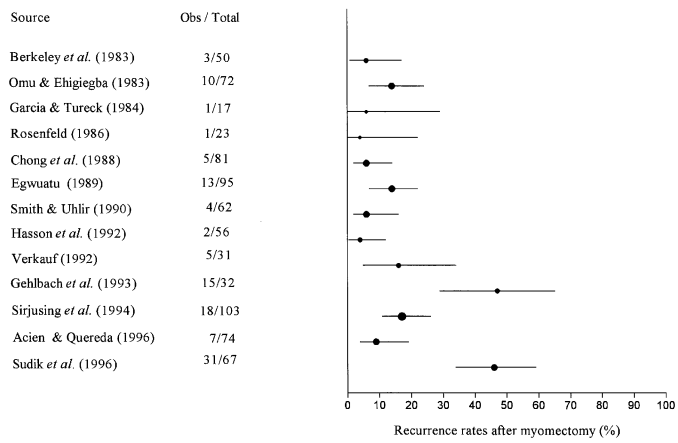

Figure 3. Percentages of recurrences after myomectomy in the considered studies. Circles represent percentage point estimates and horizontal lines 95% confidence intervals. Figures have been rounded up to the next whole number.

from prospective studies. A thorough literature review was performed adopting different modalities of article search and data were extracted from the reports of two independent observers. Even considering all the problems and difficulties in interpretation, the information included in our review is the only available evidence on which to base clinical understanding and therapeutic decision making. More generally, the overall estimates obtained probably represent average evidence of the effect of abdominal myomectomy in various clinical conditions. Our analysis suggests that the efficacy of conservative surgery for uterine fibroids in women with otherwise unexplained infertility was fairly good, with ~60% of subjects becoming pregnant within a year of surgery. This figure is higher than that observed in couples with no demonstrable cause of infertility followed without treatment (Templeton and Penney, 1982; Collins *et al.*, 1983; Barnea *et al.*, 1985; Diczfalusy and Crosignani, 1996) and seems successful considering that most patients were >30 years of age at the time of surgery. This outcome was significantly better than that obtained in the presence of additional infertility factors when the pregnancy rate was reduced by almost 20%. It is unclear if the number, diameter and location of removed fibroids had a definite role in influencing the postoperative pregnancy rate. In particular, no difference in outcome was observed in women with or without submucous tumours. However, this should be investigated further as it could be supposed that lesions distorting the uterine cavity may impair fertility to a greater extent than intramural or subserosal nodes. The reported rates of myoma recurrence and need for re-operation are generally optimistic, but should probably be considered with caution as percentages may vary greatly in relation to diagnostic modalities adopted and duration of follow-up. The cumulative 10-year recurrence rate observed in a large cohort of women operated consecutively in our department was 27% (84 recurrences/622 operated patients), and this increased steadily up to the end of the observation period (Candiani *et al.*, 1991).

In conclusion, according to the available evidence, slightly less than two-thirds of women with uterine leiomyomas and otherwise unexplained infertility conceived shortly after

conservative surgery. It is unclear if the prognosis was influenced by the site of tumours. However, patients with submucous myomas usually report also menorrhagia, which constitutes a definite indication for operation. The presence of additional factors impairing pregnancy, which may significantly worsen the reproductive prognosis, should be given adequate weight when deciding between different treatment options. Despite the difficulties implicit in designing and conducting a randomized controlled trial in this type of study population, we still believe that unbiased comparison with expectant management is needed before drawing definitive conclusions on the effectiveness of a time-honoured conservative surgical procedure such as myomectomy.

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