

# Live birth following day surgery reversal of female sterilisation in women older than 40 years: a realistic option in Australia?

Oswald M Petrucco, Sherman J Silber, Sarah L Chamberlain, Graham M Warnes and Michael Davies

**S**terilisation is common in Australia and the United States, usually chosen at family completion. Requests for renewed fertility arise because of a new partner, improved economic circumstances or, more rarely, death of a child. Current options for renewed fertility include in-vitro fertilisation (IVF) or surgical reanastomosis of the fallopian tubes. There are many financial and clinical implications in the choice of treatment, particularly for women aged 40 years and older. Human fertility decreases markedly at the end of reproductive life, with age-related fecundity declining rapidly after age 40 years, particularly in sub-fertile women. Possibly for this reason, the American Fertility Society recommends that women older than 40 years have IVF and not undergo reversal of sterilisation.<sup>1</sup>

In Australia, the live birth rate following IVF treatment is 5% for women aged 40–42 years and 2% for older women.<sup>2,3</sup> IVF requires intensive treatment by a team of doctors, nurses and counsellors, with each repeat fresh or frozen embryo thaw cycle incurring additional emotional and financial costs. The use of assisted reproductive technology has caused a significant increase in high-risk multiple pregnancies across all ages, which has given impetus for single embryo transfers, with subsequent increase in the number of treatment cycles to achieve success.

For women choosing tubal reanastomosis, markedly different financial circumstances apply. In Australia since 1997, when Medicare payment for reversal of sterilisation was withdrawn, the choice has been to self-fund a reversal operation or to undergo Medicare-funded and "safety net"-supported IVF treatment, for which most of the cost is reimbursed in second and subsequent IVF treatments in the same calendar year. Tubal reanastomosis requires a general anaesthetic and day surgery admission, but offers the prospect of spontaneous pregnancy with a natural background rate of multiple pregnancy of less than 2% and the opportunity to have more than one child before reconsidering contraceptive options. However, the most important difference is the restored capacity for conception with each ovulatory cycle, which may provide an explanation for conception in older women when gonado-

## ABSTRACT

**Objective:** To determine the live birth rate following surgical reversal of sterilisation in women aged 40 years and older.

**Design:** Retrospective cohort study of pregnancy outcome following day surgery microsurgical reversal of sterilisation performed by two reproductive microsurgeons in the private sector.

**Setting and patients:** 47 patients (aged 40 years or older) who had reversal of sterilisation performed between 1997 and 2005 in Adelaide, South Australia ( $n = 35$ ), or the Infertility Centre of St Louis, Missouri, USA ( $n = 12$ ).

**Main outcome measures:** Independently audited live birth surviving the neonatal period.

**Results:** Of the 47 patients on whom follow-up was obtainable from the two centres, 19 (40%) had a live birth, 7 had had only a first trimester miscarriage at the time of follow-up, and 21 (44%) had failed to conceive. Age at conception ranged between 40 and 47 years. Two women had two live births following surgery. The total direct costs (Australian dollars, adjusted to 2005) in Australia were \$4850 per treatment, and \$11 317 per live birth. The corresponding direct cost of a single cycle of in-vitro fertilisation (IVF) in Australia has been estimated at \$6940, with a cost per live birth of \$97 884 for women aged 40–42 years and \$182 794 for older women.

**Conclusion:** Previously sterilised women wanting further pregnancy should be offered tubal surgery as an alternative to IVF, as it offers them the opportunity to have an entirely natural pregnancy. In settings where IVF is financially supported by government agencies or insurance, tubal reversal is a highly cost-effective strategy for the previously fertile woman.

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trophin-stimulated oocyte development, fertilisation and implantation seem to be no longer successful.

The main factors influencing success following reanastomosis are the site of anastomosis,<sup>4–6</sup> length of residual fallopian tube, and the surgical technique.<sup>7</sup> For the most commonly encountered Filshie or Hulka Clip and Falope-Ring type of sterilisation, microsurgery offers a very high chance of tubal patency and fertility. Live birth rates of 80%–90% are achievable in women younger than 40 years,<sup>8–12</sup> with poorer outcomes in women aged 40 years or older.<sup>13–16</sup>

Our aim in this retrospective cohort study was to assess whether tubal microsurgery in women aged 40 years and older is a viable alternative to IVF treatment.

## METHOD

### Study population

Consenting women aged 40 years or older who had tubal reanastomosis between 1997

and 2005 by two microsurgeons (OMP in Australia and SJS in the United States) were asked to provide details of subsequent pregnancies, by postal questionnaire or phone consultation.

All women in the final dataset had either been pregnant or had at least 12 months' exposure to conception after reversal of sterilisation.

### Surgical technique

The methods of sterilisation were tubal clips (70%), Falope-Ring (23%) and Pomeroy tubal ligation (7%). The reversal procedure involved a 3–5 cm suprapubic incision, into which the uterine fundus and fallopian tubes were manipulated via a transcervical uterine cannula. A two-layer 8-0 nylon microsurgical anastomosis was performed on the exposed new tubal ends. Magnification (10–25 $\times$ ) was provided by an OPMI5 Zeiss operating microscope, and tubal patency was confirmed following anastomosis by transcervical instillation of dilute methyl-

## Age and conception intervals for women with births after reversal of sterilisation

Age at operation (years)	Time to conception (weeks)	Age at conception (years)
<b>Adelaide</b>		
41	4	42
40	8	41
40	4	40
44	52	45
44	8	44
44*	8	47
40	24	41
40	8	41
40	12	40
40	64	41
45	5	45
43	6	44
40	22	41
44	32	45
40	234	44†
<b>St Louis</b>		
40	104	42
40	104	42
40	80	42
42	18	43
40	49	41
40*	49	43

\* Second birth for the preceding individual.

† Couple had four miscarriages before the term pregnancy.

were excluded as they were using contraception and not attempting to conceive because of an intercurrent illness. Live births and women's ages at conception are shown in the Box. Of the 35 Australian women, 20 had been pregnant, although six of these had miscarriages. There were 15 live births (two for one couple). In the St Louis group, six of the 12 women had been pregnant and five had six live births. Overall, 19 of the 47 women had at least one live birth (40%), with six conceptions occurring in women aged 44 years or older and conception reported up to age 47 years. Time to conception ranged from 4 weeks to 4 years. No significant surgical complications occurred and no ectopic pregnancies were reported.

The average monetary cost (Australian dollars, adjusted to 2005) to women having this procedure in the private sector in Australia was \$4850, and the cost per live birth was \$11 317. This compares very favourably with IVF, where the average cost per cycle in Australia in 2002 was \$6940, and the cost per live birth was \$97 884 for women aged 40–42 years and \$182 794 for women aged 42 years or older.<sup>3</sup> Similar ratios of cost-effectiveness of tubal reversal compared with IVF apply in the US.

## DISCUSSION

In this study, the reversal group had all been previously fertile, making direct comparison of success rates for women having IVF not possible, as couples having IVF have multifactorial reasons for accessing treatment, including male-factor infertility. However, our observation that reversal of sterilisation provides a good prospect for fertility indicates that conception is more likely to occur in natural ovulatory cycles than in stimulated IVF cycles. It may be significant that six live births in the study group occurred in women aged 44 years or older, an age when the likelihood of live birth from IVF is extremely low. Additional evidence for natural fertility in older women is seen in a study of reversal of vasectomy, in which 61% of female partners older than 40 years conceived.<sup>17</sup>

A number of publications and editorials have addressed the issue of fertility and ageing. Discussion largely focuses on age-related increase in meiotic non-disjunction, leading to chromosomal aneuploidy, low implantation rates, and a high rate of early pregnancy loss.<sup>18–23</sup> In view of the comparison of cost per live birth, we believe Medicare funding for reversal of sterilisation should be reinstated.

## COMPETING INTERESTS

None identified.

## AUTHOR DETAILS

Oswald M Petrucco, FRCOG, FRACOG, CREI, Associate Professor<sup>1</sup>

Sherman J Silber, MD, Director<sup>2</sup>

Sarah L Chamberlain, 6th Year Medical Student<sup>1</sup>

Graham M Warnes, PhD, BAgriSci(Hons), Scientist<sup>1,3</sup>

Michael Davies, BA(Hons), MPH, PhD, Senior Research Fellow, Epidemiology<sup>1</sup>

1 Discipline of Obstetrics and Gynaecology, University of Adelaide, Adelaide, SA.

2 Infertility Center of St Louis, St Luke's Hospital, St Louis, Mo, USA.

3 Repromed Pty Ltd, Adelaide, SA.

Correspondence:  
ossie\_petrucco@internode.on.net

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ene blue dye. Reconstituted tubal lengths were greater than 4 cm in all cases, and the anastomoses were isthmic (85%), tubocornual (5%) and isthmic ampullary (10%). Patients were discharged from hospital within 24 hours of admission.

## Ethics approval

The Australian study received ethics approval from the University of Adelaide Ethics Committee. Another 12 patients who were not part of the ethics-approved study but who fulfilled all criteria were provided by SJS of St Louis, Missouri, US.

## RESULTS

Of the 47 eligible patients in the Australian group, three could not be found and seven refused enrolment. Two consenting women

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