# **Original** Article

# Does repeated electro-ejaculation improve sperm quality in spinal cord injured men?

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Study design: Retrospective analysis.

**Objectives:** To assess the effect of repeated electro-ejaculation on the sperm quality in spinal cord injured men.

Setting: Regional Spinal Injuries Unit, Southport, UK and Hewitt Center for Reproductive Medicine, Liverpool, UK.

**Method:** Retrospective, observational study of men with spinal cord injuries undergoing repeated electro-ejaculation as a part of fertility treatment.

**Result:** There was no improvement in the volume, sperm concentration, motility or the total motile count in the successive antegrade and retrograde samples following repeated electro-ejaculations.

**Conclusion:** Electro-ejaculation is an invasive procedure and its use should be restricted to obtaining semen sample for carrying out assisted conception procedures only.

Sponsorship: None.

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#### Introduction

One of the major consequences of spinal cord injury (SCI) in male patients is infertility. It is estimated that approximately 50% of these injuries in the United States involve young men in the age group of 18–45 years.<sup>1</sup> Less than 5% of these men can procreate without medical intervention, the majority requiring intrauterine insemination or in vitro fertilisation with intracytoplasmic sperm injection (IVF/ICSI).<sup>2</sup> The reasons for poor semen quality in spinal cord injured men is not clear. Possible factors contributing to poor semen quality include stasis of vesicular and prostatic fluid, testicular hyperthermia causing damage to the spermatozoa, recurrent urinary tract infections (UTI), sperm contact with urine, presence of sperm autoantibodies and neuro-endocrine changes involving the hypothalamic-pituitary axis.<sup>3</sup>

There have been varying reports in the literature regarding the effect of repeated ejaculations on semen quality in this group of men. A large retrospective analysis of cross-sectional data by Brackett *et al*<sup>4</sup>

concluded that although sperm quality was suboptimal following spinal injury, the decline did not appear to progress with increase in duration after spinal injury.

A study by Siosteen *et al*<sup>5</sup> reported the effect of repeated assisted ejaculations on 23 spinal cord injured men over 4–6 months. The study showed an improvement in the semen volume, fructose and acid-phosphatase in the seminal plasma suggesting an improvement in the function of seminal vesicles and the prostate gland. However, the subjects already had a high total count in the first ejaculate and the percentage of motile count did not change at the end of 4–6 months of the study.

Sonksen *et al*<sup>6</sup> conducted a similar study on 19 SCI men and followed the subjects for a period of 12 months. They concluded that repeated ejaculations produced no significant changes in the semen quality.

Bladder management and the neurological level of injury also appear to have an impact on the semen quality. Studies have shown that individuals with lowpressure bladder emptying using either an indwelling catheter or intermittent self-catheterisation had higher motile sperm concentrations when compared to those npş

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with reflex voiding or straining.<sup>7,8</sup> Ohl *et al*<sup>9</sup> have also demonstrated that urinary infection is associated with slightly lower sperm quality and lower pregnancy rates of 10 *versus* 30% when compared to patients with sterile urine. Previous study in our unit has shown that presence and concentration of white cells in the ejaculate was dependent on associated UTI at the time of collection and, although adequate treatment of the infection reduced the leucocyte population in the ejaculate, it did not necessarily improve sperm function.<sup>10</sup>

## Aim

A retrospective study of clinical practice in the Spinal Injuries Unit, Southport, and Reproductive Medicine Unit, Liverpool, was undertaken. The aim of the study was to evaluate the effect of repeated electro-ejaculation on the sperm quality in men with chronic spinal cord injuries.

Repeated electro-ejaculation was routinely carried out in order to improve sperm quality in men who attended the unit for fertility treatment.

#### Materials and methods

Clinical notes of 16 men with chronic SCI who underwent electro-ejaculation for producing a semen sample were used to obtain data for the study. Routine practice involved three successive electro-ejaculations at 2-4 week interval. This method was chosen only when vibro-stimulation was either unsuitable or had failed. Before electro-ejaculation, the bladder was catheterised and instilled with 10 ml of Ham's F-10 culture medium. The procedure was performed using Saeger Electroejaculation equipment (Dalzell USA Medical Systems, Dungannon, Northern Ireland). The patient was placed in the lateral decubitus position and a 31-mm-diameter probe was inserted into the rectum. Stimulation was performed using a voltage range of 7-35 V, each stimulation lasting 2–4 s until an emission was obtained. During stimulation, the perineum and bulbous urethra were massaged and the antegrade fraction of the ejaculate was collected in a sterile container. At the end of the procedure, the bladder was re-catheterised and the retrograde fraction was recovered. Proctoscopy was performed before and after the procedure to ensure that no thermal injury had been caused to the rectal mucosa. All procedures were carried out under light general anaesthesia.

Both antegrade and retrograde ejaculates were examined regarding semen volume, sperm concentration, sperm motility, sperm viability and the total motile sperm concentration. Changes in these parameters between the three semen samples were analysed to ascertain any improvement in the semen quality. The Wilcoxon signed rank test was used to determine the significance of the change in these variables in the antegrade and retrograde samples separately.

#### Results

Table 1 shows the characteristics of the men included in the study. The median age of the patients was 37 years (range 24–46 years). The median duration of injury was 12.5 years (range 5–43 years). In all, 11 patients (63%) used reflex voiding as the method for bladder management, whereas five men (31%) used low-pressure bladder emptying methods.

Overall, from sample 1 to 3, the antegrade fraction showed an improvement in the volume of ejaculate in six men (38%), concentration in seven (44%), motility in five (31%) and the total motile count in five men (31%). In the retrograde fraction, improvement was noted in ejaculate volume in two men (13%), concentration in four (25%), motility in three (19), and total motile count in three (19%) (Tables 2 and 3). Table 4 summarises the changes in each variable from the first to third samples. There was a median decrease in volume of the retrograde fraction from the first to third sample of 1.45 (range -8.5, 78.3) and this was the only variable that just reached statistical significance at the 5% level. As the retrograde volume is dependent on the urine volume and the fixed volume of medium instilled before the procedure, this decrease in volume from the first to third sample is unlikely to be of clinical importance. Also, the effect of multiple testing must be appreciated (as 30 hypothesis tests were carried out, and 1 in 20 of these tests would be expected to be significant at the 5% level purely because of random variation). No other para-

 Table 1
 Characteristics of the study group

Age (years)	37 (24, 46)
Duration of injury (years)	12.5 (5, 43)
Level of injury*	
C4–5	2 (13)
C5–6	1 (6)
C6-7	2 (13)
C7	1 (6)
L1	1 (6)
L1-2	1 (6)
T1-2	1 (6)
T10	1 (6)
T12-L1	3 (19)
T4-5	1 (6)
T6-7	1 (6)
17-8	1 (6)
Degree of injury*	
Complete	9 (56)
Incomplete	7 (44)
Bladder management*	
Reflex void and sheath	11 (63)
Intermittent catheterisation	3 (19)
Indwelling catheter	1 (6)
Normal	1 (6)

Values are median (range) or \*number (%)

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Antegrade samples 1–3	Volume n (%)	Sperm concentration n (%)	Motility n (%)	Total motile count n (%)
Increase	6 (38)	7 (44)	5 (31)	5 (31)
No change	4 (25)	2(13)	5 (31)	7 (44)
Decrease	6 (38)	7 (44)	6 (38)	4 (25)

**Table 2** Change in parameters from first to third sample in the antegrade ejaculate (n = 16)

Values are number (%)

**Table 3** Change in parameters from first to third sample in the retrograde ejaculate (n = 16)

Retrograde samples 1–3	Volume n (%)	Sperm concentration n (%)	Motility n (%)	Total motile count n (%)
Increase	2 (13)	4 (25)	3 (19)	3 (19)
No change	6 (38)	6 (38)	9 (56)	9 (56)
Decrease	8 (50)	6 (38)	4 (25)	4 (25)

Values are number (%)

Table 4 Summary of the difference in parameters from first to third samples in both antegrade and retrograde ejaculates

Parameter	Median $(LQ, UQ)$ difference from sample 1 to 3	Range of differences	P-value	
Volume				
Antegrade	0(-3.05, 0.65)	(-18, 10.5)	0.566	
Retrograde	1.45 (0, 7.75)	(-8.5, 78.3)	0.045	
Concentration				
Antegrade	0 (-47.3, 52.05)	(-330, 210)	0.816	
Retrograde	0 (-3.5, 17.85)	(-18.2, 350.4)	0.408	
Motility				
Antegrade	0 (-0.5, 6.25)	(-15, 53)	0.445	
Retrograde	0 (0, 0.5)	(-14.3, 12)	0.841	
Total motile count				
Antegrade	0(-2.78, 2)	(-416, 71.7)	0.745	
Retrograde	0 (0, 0.58)	(-74.6, 397.5)	0.666	

LQ, lower quartile value; UQ, upper quartile value; Volume, in milliliters; Concentration, concentration of sperm/ml; Motility, motile sperm count/ml; Total motile count, total motile sperm count

Positive values indicate a higher value of the variable in the first sample. P-values obtained from Wilcoxon signed rank test

meters showed any significant differences between the three consecutive assisted ejaculations.

Changes in parameters were assessed when the participants were grouped according to the type of bladder management and duration since injury. In the low-pressure bladder management group, only two (40%) of patients showed an increase in volume and total motile count, and the sperm concentration improved in only one (20%). The results were similar in the high-pressure bladder management group with an increase in volume noted in four (36%) men, and the sperm concentration and total motile count in six (55%)and four (36%) of the men, respectively. Results of subgroup analysis of sperm quality based on duration of spinal injury were similar in men with injury duration of 10 years or less (improvement in volume from first to third antegrade ejaculate in three men (50%), sperm concentration in three men (50%) and total motile count in two (33%)) and those with injury duration greater than 10 years (improvement in three men (30%), four (40%) and three (30%), respectively). The significance of any differences between these groups of men was not assessed formally because of small sample size.

## Discussion

The mechanisms responsible for poor semen quality in SCI males is possibly multifactorial and poorly understood. Although limited by small sample size, our results have replicated those reported by Brackett *et al*<sup>4</sup> and Sonksen *et al.*<sup>5</sup> Although the effect of the duration of spinal injury was not formally assessed, our data also appear to support the conclusion by Brackett *et al.*<sup>4</sup>

The theory that repeated ejaculation improves semen quality by clearing the genital tract of static sperm in varying stages of functional deterioration appears flawed. In addition to previously recognised contributory factors, increased cytokine activity in the seminal plasma has been demonstrated by Basu *et al*<sup>11</sup> suggesting that enhanced T-cell-mediated immune response following spinal injury may play an important role in poor sperm function despite the sperm count being maintained in some cases.

With advances in the field of assisted reproduction techniques, the use of an invasive procedure like electroejaculation with its associated complications should be limited. Procuring a semen sample either for the purposes of cryopreservation of sperm soon after injury, before a decline in quality begins,<sup>12</sup> or at the time of assisted reproduction techniques appears to be the only justifiable reason for the use of electro-ejaculation in spinal cord injured men. It has also been conclusively shown that penile vibro-stimulation (PSV) technique is safer and provides semen specimens of a better quality than electro-ejaculation.<sup>13</sup> In circumstances where PSV fails to provide a specimen, a single electro-ejaculation, preferably using interrupted current<sup>14</sup> to minimise the risk of procedure-related complications is the only requirement for successful fertility treatment as long as a post thaw representative of the frozen sample has sufficient sperm for IVF/ICSI.

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