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Semen retrieval by penile vibratory stimulation in men with spinal cord injury

Nancy L.Brackett[1]

The Miami Project to Cure Paralysis, University of Miami School of Medicine, Miami, Florida, USA

Traumatic spinal cord injury resulting from car accidents, falls, violence or sport-related activities is a common occurrence throughout the world. Spinal cord injuries occur most often to young men in their parenting years. Among the medical challenges facing many of these men is the inability to ejaculate via sexual intercourse. To achieve biological fatherhood, their semen may be retrieved by methods of assisted ejaculation. This paper discusses the use of penile vibratory stimulation in men with spinal cord injury, and includes the topics: patient selection and management; proper placement and timing of stimulation; appropriate use of low-amplitude, high-amplitude or dual vibrators; and factors influencing ejaculatory success rate. Also summarized are recent data on semen quality in men with spinal cord injury. When performed properly, penile vibratory stimulation is a safe and easy method of obtaining semen from anejaculatory men with spinal cord injury. Semen quality is better when obtained by penile vibratory stimulation compared with electroejaculation, an alternative method of semen retrieval. For these reasons, and because of the low investment of time and money, it is recommended that penile vibratory stimulation be used as the first line of treatment for anejaculation in men with spinal cord injury.

Key words: ejaculation/infertility/penile vibratory stimulation/semen/spinal cord injuries

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Introduction

Spinal cord injury is a common occurrence throughout the world. In the United States alone, 10 000 new spinal cord injuries occur every year (Stover *et al.*, 1995). Although global statistics have not been reported, there are estimated to be millions of spinal cord injury survivors throughout the world. In the United States and other countries, most spinal cord injuries occur to men, and in particular, young men between the ages of 16–35 years. Common causes of spinal cord injury include motor vehicle accidents, falls, sports injuries and violence (Tan *et al.*, 1979; Gee and Sinha, 1982; Kuhn *et al.*, 1983; Barros *et al.*, 1990; da Paz *et al.*, 1992; Knutsdottir, 1993; Hart and Williams, 1994; Karamehmetoglu *et al.*, 1995; Stover *et al.*, 1995; Maharaj, 1996; Schonherr *et al.*, 1996; Chen *et al.*, 1997; Exner and Meinecke, 1997; Otom *et al.*, 1997; Suyama *et al.*, 1997). Following a spinal cord injury, many men want to know if they will be able to father children. In most cases, biological fatherhood is possible but requires medical assistance. The extent of assistance depends on the man's ability to ejaculate, and on the quality of his semen. Although most men with spinal cord injury can have erections of some kind (reflexogenic, psychogenic or pharmacological; Martinez-Arizala and Brackett, 1994), most cannot ejaculate during intercourse (Bors and Comarr, 1960). This neurogenic anejaculation can result from any disruption of supraspinal or peripheral innervation of the spinal ejaculatory reflex centres (Martinez-Arizala and Brackett, 1994).

To retrieve semen for analysis or for insemination, methods of assisted ejaculation are available, the most common of which are penile vibratory stimulation (PVS) and rectal probe electroejaculation (EEJ). In PVS, a vibrator is placed against the penis and mechanical stimulation is delivered to induce ejaculation. In EEJ, a probe containing electrodes is placed into the rectum and electrical stimulation is delivered to cause the

[1]Address for correspondence: The Miami Project to Cure Paralysis, University of Miami School of Medicine, 1600 N.W. 10th Avenue, R-48, Miami, Florida 33136, USA

release of semen—usually appearing more like an emission than an ejaculation. To retrieve semen from men with spinal cord injury, it is recommended that EEJ be used only if PVS fails. The basis for this recommendation is that PVS is less invasive, is preferred more by patients (Ohl *et al.*, 1997), and results in better semen quality than EEJ (Brackett *et al.*, 1997a; Ohl *et al.*, 1997).

This report will provide a detailed discussion of the use of PVS in men with spinal cord injury. Most of the data presented are from studies of men with spinal cord injury enrolled as research subjects in the Male Fertility Research Programme of the Miami Project to Cure Paralysis, located at the University of Miami School of Medicine, Miami, Florida, USA. Since 1991, we have performed 937 PVS procedures and 681 EEJ procedures on a total of 275 men with spinal cord injury. In those procedures that resulted in ejaculation, we have performed a total of 3580 semen analyses, including all anterograde and retrograde specimens. These data, and those from other groups, will be reviewed.

Performing penile vibratory stimulation

Patient selection

Almost any man with spinal cord injury—regardless of level of injury—is a candidate for PVS, although certain medical conditions are relatively contraindicated. Severe inflammation or irritation of the glans penis, which sometimes occurs in patients who wear condom catheters, is a relative contraindication because PVS may lead to further skin abrasion. PVS should not be administered to patients with untreated hypertension or cardiac disease, as PVS may cause an increase in blood pressure. In patients with a penile prosthesis, PVS must be applied with care, as the pressure of the vibrator may push the glans onto the distal end of the prosthesis. An additional contraindication is the patient's inability to comprehend instructions about the procedure. As a note of caution, it has been our experience that patients recently injured (i.e. <18 months) may not respond readily to PVS. Often, their ejaculatory response becomes apparent only after 9–18 months.

Preparation of patients

Orientation and medical history

Before the first trial of PVS, it is advisable that the patient be oriented to the procedure and to the potential responses he may experience. His neurological level of injury should be assessed and a complete medical history taken, with special attention to autonomic dysreflexia and attempts at ejaculation since spinal cord injury.

Type of examination table

PVS is best performed with the patient transferred from his wheelchair to a multi-positional examination table or hospital-type bed. The back of the table should have the ability to recline so that the patient may be positioned at angles ranging from sitting to supine. In some patients, a particular angle optimizes ejaculation. It is preferable (and safer) to use an examination table that can be lowered to wheelchair level. Some standard examination tables cannot be lowered to wheelchair level, thus requiring the patient to lift himself, or be lifted, 20–40 cm to clear the table. This can be a dangerous manipulation. Even with a proper examination table, it is advisable that rehabilitation-trained personnel transfer and position some patients, especially those with high cervical injuries, those with severe pain or obesity, or those wearing spinal cord stabilization devices. If transfer is very problematic, it is possible for PVS to be performed with a patient in his wheelchair (see video, Brackett, 1999). The primary concern is safety. Most importantly, the patient must be in a safe position to manage should he experience severe spasticity or autonomic dysreflexia during PVS.

Bladder preparation

Once the patient is safely positioned, blood pressure medication is given if necessary (see 'Management of autonomic dysreflexia'). Next, the bladder is prepared in patients likely to have retrograde ejaculation, and/or in patients likely to ejaculate urine along with semen. (These features will not be known until the patient's ejaculation history is established.) The patient's bladder is drained by urinary catheterization, and 25–50 ml sperm washing buffer is instilled into the bladder. The bladder should be prepared immediately (no more than 10 min) before PVS, to minimize accumulation of urine.

For patients whose bladders are managed with suprapubic catheters, the following may be done before a trial of PVS. First, the bladder should be lavaged with aliquots of normal saline until no sediment is seen in the fluid. Lavage should be repeated once or twice with the sperm washing medium of your choice. Finally, 25–50 ml of sperm washing medium should be left in the bladder. The suprapubic tube is clamped during PVS. A collection cup should still be held at the meatus, as the suprapubic tube does not preclude anterograde ejaculation.

Management of autonomic dysreflexia

Patients with injuries at T6 or above are prone to autonomic dysreflexia which is an exaggerated sympathetic response to an afferent stimulus. Common symptoms include high blood pressure, sweating, chills and headache which, if not managed properly, can lead to dangerously high blood pressure levels. Autonomic dysreflexia can occur suddenly by any irritating stimulus introduced to the body below the level of injury, such as an overfull bladder or impacted bowel (Lee *et al.*, 1995; Monograph 1, 1997; The PoinTIS Rehab Team Site, 1998). In some patients, PVS or EEJ can cause autonomic dysreflexia, but with correct medication, symptoms can be safely managed. Patients at risk (i.e. any patient with an injury at T6 or higher, or any patient with a history of autonomic dysreflexia) should be given between 10 and 40 mg of nifedipine, sublingually, 15 min before PVS.

Figure 1. The FERTI CARE® *clinic* (left) and the FERTI CARE® *personal* (right) vibrators (Multicept, Denmark) are medical devices that have been engineered specifically for ejaculation of men with spinal cord injury. They can deliver an amplitude of 2.5 mm when pressed against the penis. In spinal cord-injured men, this amplitude results in a higher ejaculatory success rate compared with lower amplitudes.

Figure 2. While not specifically made for ejaculation of men with spinal cord injury, a wide variety of devices may be used to deliver penile vibratory stimulation. Typically called 'massagers' in the United States, these devices are sold 'off-the-shelf' in drug stores or department stores. They are marketed to the general public for use in muscle massage. Those shown in the picture deliver an amplitude of 1.6 mm or less, and are not as effective for inducing ejaculation in men with spinal cord injury as are the high-amplitude vibrators shown in Figure 1. The advantage of these vibrators is that they are usually less expensive and easier to obtain than high-amplitude vibrators.

Our standard procedure is to start with 20 mg of nifedipine, and then increase or decrease the dose on subsequent trials based on the patient's response. In patients with a very labile blood pressure, 0.4 mg nitroglycerine, given sublingually, may be used in addition to nifedipine. In these patients, PVS should be started within 30 s of nitroglycerine administration. During PVS, blood pressure should be monitored every minute, preferably with an automatic blood pressure cuff.

In a study of 211 men with spinal cord injury ranging between C3 and L3, 41% required nifedipine for autonomic dysreflexia, and in all but three the level of injury was T8 or higher. Of those who received nifedipine, 17.2% also required nitroglycerine during at least one trial (Brackett *et al.*, 1998a).

Vibrator selection

Vibrators have been designed specifically for ejaculation of men with spinal cord injury (Figure 1). These vibrators have the capability of delivering an amplitude of 2.5 mm when pressed against the penis, and this amplitude has been found to significantly increase ejaculatory success rate compared with lower amplitudes (Sonksen *et al.*, 1994; Brackett *et al.*, 1998a). For the purposes of this report, such vibrators will be referred to as 'high-amplitude vibrators'.

Other commercially available devices, while not specifically designed for ejaculation of men with spinal cord injury, may be used for this purpose. Typically called 'massagers' in the United States, such devices are marketed to the general public for relief of muscle strain (Figure 2). Most of these massagers deliver an unloaded amplitude of 1.6 mm or less, and for the purposes of this report, they will be referred to as 'low-amplitude vibrators'.

The decision of which vibrator to use on a particular patient depends on the goal of the ejaculation trial. If the goal is to perform physician-assisted semen retrieval, our choice is the FERTI CARE® *clinic* (see Figure 1). While it has the same ejaculatory success rate as the FERTI CARE® *personal* (Brackett *et al.*, 1998a), we find that the former device maintains a loaded amplitude more reliably than the latter device. If the goal is to provide patient education for home PVS, patient preference should be considered. In these cases, the physician (or other health care professional) may want to demonstrate PVS with a vibrator similar to one the patient will be using at home. Patients find it helpful to be given the information that commercial vibrators vary in amplitude, cost and ease of use.

PVS procedure

Personnel

We recommend that two or three professionals be present during PVS, depending on the complexity of the case. One professional holds the vibrator on the penis, one collects the semen, and a third attends to the patient's symptoms, if necessary. In simple cases, only one professional may be necessary, as for example, in the case of a patient who can hold the vibrator or the specimen cup during PVS, and who does not get autonomic dysreflexia or severe spasticity during ejaculation.

Vibrator hygiene

When the same vibrator is to be used on more than one patient, it should be cleaned or sterilized after each use. With some vibrators, i.e. the FERTI CARE® *clinic* and the FERTI CARE® *personal*, the part making contact with the patient can be removed for cleaning or sterilizing. With other vibrators, i.e. many low-amplitude massagers, the part making contact with the patient cannot be removed; thus, to maintain hygiene during PVS, the head of such vibrators can be covered with a sterile, non-spermicidal condom, such as the Male-FactorPaks (Model #MFP-130, Norwell Technologies, Inc., Marietta, GA, USA).

Vibrator placement and timing

For a patient's first trial of PVS, we typically position him reclining at a 45° angle. There is no particular reason for this, other than it allows him to see what we are doing, and it gives us enough room to work. The vibrator should be placed on the glans of the penis, either the dorsum or frenulum (see video, Brackett, 1999). Placement on the shaft of the penis, or on the perineum is less effective. Placement on the testicles could cause injury. When applying the vibrator, use firm pressure except in patients with a penile implant (see 'Patient selection'). Unless the vibrator comes with an amplitude indicator, such as the FERTI CARE® *clinic*, the exact loaded amplitude will not be known. It is helpful to solicit verbal feedback from the patient about the amount of pressure he prefers, since some patients can detect a particular pressure that will elicit ejaculation.

In order to monitor the penile skin during PVS, the following protocol is recommended. Apply PVS for 5 min, then stop for 1 min and inspect the penile skin. Repeat this step up to two more times, for a total of 15 min of PVS. Stop PVS if the penile skin bleeds or becomes oedematous, if the patient's blood pressure rises to a dangerous level, if the patient requests, or if ejaculation occurs. More than 15 min of PVS in one session may lead to penile skin breakdown.

Somatic responses during PVS

An anterograde ejaculate does not always occur in a man with spinal cord injury; thus, in the absence of any problematic symptoms or time endpoint, it is important to know when to stop PVS. If there is no anterograde specimen, the best indicators of a retrograde ejaculate are a cumulative building of somatic responses (as described below), contraction of the periurethral muscles, and an increase in blood pressure.

In a study of 211 men with spinal cord injury, somatic responses were observed on 100% of trials that resulted in anterograde and/or retrograde ejaculation (Brackett *et al.*, 1998a). The most common somatic response was contraction of the abdominal muscles, followed in frequency of occurrence by spasticity below the level of injury, knee flexion, hip flexion and abduction of the thighs. Periurethral muscle contractions could be felt on most of the trials in which ejaculation occurred. However, these somatic responses were not predictive of ejaculation. In approximately half of the trials, there were one or more somatic responses but no anterograde or retrograde ejaculation. A lack of somatic responses, however, was 100% predictive of no ejaculation. Similarly, erection was not a good predictor of ejaculation. Onset of erection relative to ejaculation occurred with similar frequencies: before ejaculation, during ejaculation, after ejaculation, and never.

When to check for a retrograde ejaculate

At the conclusion of a PVS trial, a decision must be made about the necessity of urinary catheterization to check for a retrograde ejaculate. Generally, post-procedure urinary catheterization should be done on any trial in which somatic responses but no anterograde ejaculate occurred. On trials in which an anterograde ejaculate occurred, a retrograde ejaculate should be checked: on a patient's first visit (to establish the medical history); if the volume of anterograde ejaculate is low (<0.5 ml); or if the sperm count is unexpectedly low (i.e. significantly lower than previous trials). It is not necessary to perform urinary catheterization if recent trials of PVS have resulted in no retrograde ejaculation, or if the amount of motile spermatozoa in the anterograde specimen is sufficient for an intended assisted conception procedure.

To check for a retrograde ejaculate, the bladder contents may be retrieved by first catheterizing the bladder and emptying by gravity. Then, another 25–50 ml of sperm washing medium is used to lavage the bladder to extract any residues of ejaculate that may have fallen to the floor of the bladder and were thus not captured easily during the initial draining. We perform a second lavage if the first lavage contents are cloudy. For our purposes, we label the cup containing the initial bladder drain contents as 'R1' (for retrograde fraction 1) and the lavaged fractions as 'R2' and 'R3'. Often, the semen quality of a lavaged fraction (R2 or R3) is better than the initial fraction (R1).

Decision making after an ejaculatory failure

Failure with a low-amplitude vibrator. If no anterograde or retrograde ejaculate was obtained with a low-amplitude vibrator, then a high-amplitude vibrator should be tried next (see video, Brackett, 1999). This is recommended especially if somatic responses were observed during low-amplitude stimulation. Although ejaculation is unlikely with high-amplitude stimulation if no somatic responses were observed during low-amplitude stimulation, the minimal investment of time and money makes it worth at least one trial. If no somatic responses occur after 5 min of high-amplitude stimulation, the case can generally be considered an ejaculatory failure, except when the patient is in the acute phase of injury (see 'Patient selection').

Failure with a high-amplitude vibrator. The key in decision making after failure with a high-amplitude vibrator is the

degree to which somatic responses were present during stimulation. If transitory or no somatic responses were present, then the case should be considered an ejaculatory failure and referred for EEJ. If somatic responses were present—and especially if they were vigorous—subsequent trials of PVS should be performed, with at least one day between trials to let the penile skin rest. A recommended algorithm for subsequent trials is a repeat trial with a high-amplitude vibrator, and if that fails, a trial with two vibrators (the sandwich technique; see video, Brackett) with one vibrator placed on the dorsum and one on the frenulum of the glans penis.

Failure with two vibrators. If the sandwich technique fails, but vigorous somatic responses were present, other manipulations may be attempted to induce ejaculation. These include: pinching the perineum for 2 s before PVS, raising or lowering the patient's back, placing the patient flat with a rolled-up towel under his back to hyper-extend the back, altering the environment to address possible cognitive inhibition, and performing PVS with the patient's bladder full. By trial and error, we have found these arbitrary manipulations to be successful in some patients. If these measures fail to elicit ejaculation on three consecutive PVS trials, the case should be considered an ejaculatory failure and referred for EEJ.

Ejaculation

This section will summarize the results of a large-scale study of 653 trials of PVS carried out over 6 years at the Male Fertility Research Programme of the Miami Project to Cure Paralysis (Brackett *et al.*, 1998a).

Overall success rate

Out of 211 patients, 105 ejaculated, for an overall success rate of 49.8%. Collectively, patients were given 424 trials with a low-amplitude vibrator (mean 2.13 ± 0.22 trials per patient, range 1–27), and 229 trials with a high-amplitude vibrator (mean 1.60 ± 0.15 trials per patient, range 1–9).

Effect of amplitude

The success rate of ejaculation was significantly higher with high- versus low-amplitude stimulation. For example, when all subjects were analysed (i.e. those with injuries ranging from C3 to L3), 39.9% ejaculated with a low-amplitude vibrator and 54.5% ejaculated with a high-amplitude vibrator ($P < 0.02$). In patients who completed trials with both a high- and a low-amplitude vibrator ($n = 93$), high-amplitude stimulation recovered a significant percentage of patients (29.2%) who failed to ejaculate with low-amplitude stimulation ($P < 0.05$).

Level of injury

In addition to amplitude, level of injury affected the success rate of ejaculation with PVS. The higher the level of injury, the higher the success rate of ejaculation. For example, with a high-amplitude vibrator, the success rates were: 65.5% in the group of patients with an injury between C3 and C7; 54.2% with T1–T5 injuries; 40.7% with T6–T10 injuries; and 35.7% in T11–L3 injuries. With a low-amplitude vibrator, the success rates were 45.1% in C3–C7, 43.5% in T1–T5, 37.5% in T6–T10 and 18.9% in T11–L3.

Completeness of injury

Completeness of injury, as measured by the University of Miami Neurospinal Index (UMNI) (Klose *et al.*, 1980; Green *et al.*, 1985) was not predictive of ejaculatory success. For example, in subjects with complete injuries, the percentage who could ejaculate was not significantly different from the percentage who could not. This was true when using a low-amplitude vibrator (16.9% ejaculators, 22.5% non-ejaculators) or a high-amplitude vibrator (15.3% ejaculators, 22.0% non-ejaculators). Similarly, no difference was found in the percentage of ejaculators versus non-ejaculators among subjects with incomplete injuries.

Reliability of success rate

Ejaculation was reliable, since most men who ejaculated did so on 100% of their trials. For example, in those who completed two or more trials of PVS, 60.5% and 80.0% ejaculated on all of their trials with a low- and high-amplitude vibrator respectively. Even in the remaining inconsistent ejaculators, reliability was still quite good, with patients ejaculating on 61.8% and 53.3% of trials with low- and high-amplitude stimulation respectively.

Response time

For all trials on which ejaculation occurred, the mean time from stimulation onset to ejaculation (response time) was 1.72 ± 0.15 min. The mean response time was faster with a high-amplitude (0.95 ± 0.11 min, range 7 s to 6 min) compared with a low-amplitude vibrator (2.11 ± 0.22 min, range 5 s to 15 min). The majority of subjects ejaculated within 2 min: 74% and 89% of subjects with low- and high-amplitude stimulation respectively.

Interval between ejaculations

There has been no definitive study to determine the interval between ejaculations that optimizes ejaculatory success rate and/or semen quality in men with spinal cord injury. Our own experience with 275 men has shown that in general, an interval of one week or longer results in a higher success rate of ejaculation and better semen quality than shorter intervals. There have been studies to investigate if repeated ejaculation results in improved semen quality in men with spinal cord injury, with some studies finding improvement (Beretta *et al.*, 1989) and other studies not (Siosteen *et al.*, 1990; Sonksen *et al.*, 1999). To date, our observations concur with those studies finding no

improvement with repeated ejaculation [published in preliminary form (Brackett *et al.*, 1996a)].

Semen quality

In summarizing data from ours and others' studies, the most important points about semen quality in men with spinal cord injury are: generally, sperm concentration is normal, but sperm motility is abnormally low (Bennett *et al.*, 1988; Brackett *et al.*, 1994a,b, 1995); most of the immotile spermatozoa are dead (Denil *et al.*, 1992; Brackett *et al.*, 1998b); spermatozoa of spinal cord-injured men lose motility more rapidly than spermatozoa from normal men (Brackett *et al.*, 1997b); semen quality is better with PVS compared with EEJ, even in the same patient (Brackett *et al.*, 1997a; Ohl *et al.*, 1997); semen quality is better in anterograde versus retrograde specimens (Hirsch *et al.*, 1992; Brackett *et al.*, 1997a; Ohl *et al.*, 1997); and there is little difference in semen quality with high- versus low-amplitude stimulation (Brackett *et al.*, 1998a). The reason for impaired semen quality in spinal cord-injured men is unknown, but evidence suggests that factors in the seminal plasma contribute to this condition (Brackett *et al.*, 1996a,b).

Assisted conception

The same assisted reproduction techniques (ART) used to treat male factor infertility in the general population may be used to assist couples with male factor infertility due to spinal cord injury. Individual centres have reported their pregnancy success rates using various forms of ART in couples with a spinal cord-injured male partner (Brackett *et al.*, 1995; Chung *et al.*, 1995, 1998; Brinsden *et al.*, 1997; Hultling *et al.*, 1997; Sonksen *et al.*, 1997; Yamamoto *et al.*, 1997). The success rates are similar to those obtained in the general population, and it appears that for any given number of motile spermatozoa, those obtained from men with spinal cord injury offer the same potential for fertilization and pregnancy as those of non-injured men.

As with the general population, the decision of what type of ART to use should be governed by the number of motile spermatozoa obtainable, and the ease by which they may be obtained. Other factors that influence the selection of an ART include female factors, whether the couple can financially afford the procedure, how quickly they want children, and the couple's emotional stability in dealing with possible conception failures. Also of consideration is the coordination of the semen retrieval procedure with the insemination procedure. If there is a significant gap between these two procedures (for example, if the two centres performing these procedures are located a significant distance from each other), couples may have to rely on a frozen semen specimen, collected at some earlier time, for the insemination procedure.

No standard algorithm has been established for recommending ART to couples with a spinal cord-injured male partner. Some centres report successful pregnancies in couples using home insemination, with the semen collected by PVS and introduced intravaginally (Sonksen *et al.*, 1997). The criteria for recommending more advanced ART, such as intrauterine insemination, in-vitro fertilization, gamete intrafallopian transfer, the use of intracytoplasmic sperm injection, and the use of stimulation or monitoring protocols for the female, have not been standardized for these couples, and to date seem to follow a particular centre's trend for treating other aetiologies of male infertility. The evaluation of a large series of patients is needed to establish standard treatment protocols for couples with male factor infertility secondary to spinal cord injury.

Conclusions

Over the past two decades, advances in rehabilitation medicine have led to an increased life expectancy (Stover *et al.*, 1995), with concomitant social integration of men with spinal cord injury. Increasingly, these men are marrying and desiring biological fatherhood. The majority of men with spinal cord injury cannot ejaculate and thus require medically assisted ejaculation procedures to obtain their semen for diagnosis or insemination. Of the methods available, PVS should be used as the first line of treatment due to its safety, ease of use, relative effectiveness, and relatively low investment of time and money. Additionally, when compared with EEJ, semen obtained by PVS is of better quality. A wide variety of devices can deliver PVS to men with spinal cord injury; however, the best success rate of ejaculation is obtained with a high-amplitude vibrator, and excellent ones are available for this purpose. With a high-amplitude vibrator, 55% of all men with spinal cord injury can be expected to respond, and the higher the level of injury, the more likely the patient is to respond.

The chief features in performing PVS on men with spinal cord injury are: pressing the vibrator firmly against the glans; looking for somatic responses as indicators of impending ejaculation; monitoring carefully for autonomic dysreflexia; and maintaining the patient in a safe position should spasticity occur. If ejaculation is to occur, it will usually be within the first 2 min of PVS.

When performed properly, PVS is a safe and easy method of obtaining semen from anejaculatory men with spinal cord injury.

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