Table 4. Effects of Intracavernosal Injections (ICI) Utilizing Penile Medications

Author Year; Country **Score** **Research Design** **Total Sample Size**	**Methods**	**Results**
Renganathan et al. 1997 India RCT (crossover) Level 2 PEDro=4 N=28	**Population:** 28 men, Age: range 16-60 yrs. **Treatment:** Randomized to transdermal nitroglycerine or intracavernous injection of papaverine, two-week washout, crossover. **Outcome Measures:** Effectiveness of transdermal nitroglycerin vs. intracavernous injection of papaverine.	1. The erectile index for papaverine was significantly higher than that of nitroglycerine. 2. 93% who received papaverine had a complete response vs. 61% who received nitroglycerine. 3. 32% of patients had complications with papaverine vs 21% with nitroglycerine.
Soler et al. 2009 France Pre-post Level 4 N=14	**Population:** Men who sustained an abnormal prolonged erection or priapism following an intracavernous injection of prostaglandin E1 to induce erection. **Treatment:** Oral midodrine following the failure of 30 minutes of cooling procedures using ice or ether, or penile vibrator stimulation. **Outcome measures:** evaluation of penile rigidity at 30 minutes, and 1, 3 and 6 hours post treatment.	1. All patients returned to flaccid penile state within 30-45 min after midodrine administration. 2. Oral midodrine was well tolerated with few side effects and without increasing incidence of AD. 3. Complete erection could be induced again 6 months later by intracavernous injection in all treated patients.
Moemen et al. 2008 Egypt Prospective controlled trial Level 2 N=60	**Population:** 60 men with SCI and erectile dysfunction, at least 6 months post-injury, randomized into 3 groups of 20 (A, B, C). **Treatment:** Group A took sildenafil 50mg before sexual activity for 1 month; Group B were given intracorporal injection (ICI, 10 mg/ml prostaglandin E1 or 0.5 ml trimix) for 1	1. 90% of people in all groups showed improvement of erection as measured by IIEF-EF after sildenafil. 90% showed improvement in Group B after ICI, and 70% in Group C after VCD. 2. Improvement in erection reached 100% in all groups according to the GAQ, but ability to penetrate reached 90% after sildenafil, 90% after ICI, and 70% after VCD.

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	month and then took sildenafil for 1 month; Group C used vacuum constriction device (VCD) for 1 month and sildenafil for 1 month. **Outcome Measures:** International Index of Erectile Function – erectile function domain (IIEF-EF); Global Efficacy Assessment Questionnaire (GAQ); Hormonal Profile.	3. There was a significant increase in testosterone in all groups after sildenafil treatment. 4. Participants in Group B reported that ICI resulted in more rigid erections than sildenafil, but 14 participants preferred sildenafil due to easier administration; no participants in Group C were satisfied with VCD and preferred either ICI or sildenafil.
Zaslau et al. 1999 USA Pre-post Level 4 N=37	**Population:** 37 men, Age: mean 43.7 years, range 24-72 yrs, Level of injury: C3-L4. **Treatment:** Intracavernosal injection (ICI) of papaverine & prostaglandin E1 (PGE1); Dosage was titrated until satisfactory erection obtained. **Outcome Measures:** Safety & efficacy of intracavernosal injection therapy, satisfaction.	1. 28 patients (76%) responded to injection. 2. 21% ejaculated during >50 % of sexual encounters. 3. At 3 months: 77% were moderately or extremely satisfied with therapy. 4. 85% rated their intracavernosal injection -produced erections as good or excellent. 5. 60% on intracavernosal injection reported almost always or always being able to have successful intercourse.
Tang et al. 1995 Republic of China Post-test Level 4 N=15	**Population:** Men with SCI; Age: mean 38.5 yrs, range 25-50; Injury level: cervical (n=1), thoracic (n=6), lumbar (n=8); Time since injury: mean 6.3 yrs. **Treatment:** Intracavernosal Prostaglandin E1 (IC PGE1) 5µg (up to 20µg) until full erection lasting 20 minutes. **Outcome measures:** Schramek grade of erection, blood pressure, heart rate.	1. All men achieved a rigid (grade 5) functional erection lasting at least 20 mins (mean 59.1 min), except 1 found to have venogenic impotence. 2. Grade of erection improved significantly post-treatment. 3. No significant dosage effect of PGE1 in the difference between pre- and post-treatment. 4. No systemic side effects or other complications, however, 2 men complained of pain at the injection site.

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Hirsch et al. 1994 USA Pre-post Level 4 N=27	**Population:** 27 men (14 SCI, 7 multiple sclerosis, 6 discogenic disease); Age: (SCI) mean 31.5 yrs, range 22-39. **Treatment:** Intracavernosal Prostaglandin E1 (IC PGE1) 2.5µg initially, increased in 2.5µg increments, with a mean maintenance dose of 6.2 µg. **Outcome measures:** Continued home use or cessation of PGE1 at 28 months and reasons for cessation.	1. The rate of voluntary cessation in men with SCI at 28 months was 43%. 2. Main reasons for voluntary cessation among men with SCI was urinary diversion, adrenal tumor, loss of interest, insurance difficulties. 3. Self-administered IC PGE1 was safe and efficacious, with all patients completing protocol reporting excellent rigidity and no discontinuations due to inadequate erectile response or pain.
Kapoor et al. 1993 India Post-test Level 4 N=101	**Population:** 101 men with SCI; Age: range 20-51 yrs; Injury level: C4-L4, 65 paraplegia, 36 tetraplegia. **Treatment:** Intracavernosal injection (ICI) of papaverine hydrochloride. **Outcome Measures:** Erectile rigidity, duration of erection.	1. Satisfactory erection sufficient for penetration was possible in 98 patients. 2. 78 participants had good erection within 10 minutes, 13 within 20 minutes, 7 within 30 minutes. 3. Older patients required a higher dose. 4. Erections lasted from < 1 hour to >4 hours.
Bodner et al. 1992 USA Post-test Level 4 N=58	**Population**: 58 men; Age: range 19-68 yrs; Injury level: cervical (n=19), thoracic (n=32), lumbar (n=17); Impairment grade: 44 complete, 14 incomplete, 19 cervical, 32 thoracic, 17 lumbar, (53%) dropped out. **Treatment**: 7.5mg papaverine, titrated to dosage that produced adequate erection, evaluated every week during titration period, then every 2 months. **Outcome Measures:** Erectile rigidity, complications.	1. Rigid erections in 45 patients (90%). 2. 53% of participants dropped out of the program, usually after 1st injection or during titration period. 3. Main complication was prolonged erection necessitating aspiration and epinephrine injection.

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Earle et al. 1992 Australia Post test Level 4 N=22 (14)	**Population:** Men with SCI; Age: mean 35.2 yrs, range 20-45; Injury level: cervical (n=3), thoracic (n=8), lumbosacral (n=3). **Treatment:** Intracavernosal self-injection (ICI) of papaverine 2-20mg or papaverine 40mg + phentolamine 0.5 mg or prostaglandin E1 1-20µg. **Outcome measures:** Achieve erection, patient acceptance (continued use of method), partner satisfaction and complications.	1. Full erection was achieved by 19 out of 22 men. 2. Out of 14 men who took part in the survey, 12 reported continued use and satisfaction with self-injection (8 using papaverine, 1 using, papaverine + phentolamine and 3 using prostaglandin E1 – 'triple P'). 3. Partners of men with SCI responded positively in half of the cases. Two men stopped ICI due to partner disapproval. 4. Complications included blood in the urethra, prolonged erection and bruising at the injection site.