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Comparative Study of Directly Visualised Internal Urethrotomy under Local Anaesthesia by Percutaneous Intracorpus Spongiosum Block Verses Subcutaneous Periurethral Intracorpus Spongiosum Block in a Tertiary Care Hospital of Eastern India

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ABSTRACT

Urethral stricture is a prevalent urologic disorder, mainly in developing nations. For strictures smaller than 2 cm, most urologists recommend directly visualized internal urethrotomy as the first line of treatment. The usual anesthetic used for this surgery is either spinal or general. Comparing the effectiveness, safety and results of subcutaneous periurethral intracorpus spongiosum block vs percutaneous intracorpus spongiosum block during directly visible internal urethrotomy is the main goal. The study was carried out from December 2022 to February 2024 in the urology department of the RG Kar Medical College in Kolkata. Thirty-six adult patients with single, passable strictures up to two centimeters in length are randomly divided into two groups, each including eighteen individuals. Patients in Group I got 5 ml of 1% lignocaine injected slowly into the glans penis (ICSB) using a 26 G hypodermic needle, while patients in Group 2 received the same amount of 1% lignocaine ICSB using a 24 G hypodermic needle inserted subcutaneously through the periurethral route. Using a cold-cutting urethrotome, an optical internal urethrotomy was carried out right away. The visual analogue scale (VAS) was used to measure the patient's discomfort during the surgery and one hour after using a questionnaire. Prior to, during and after the surgery, changes in vital parameters including heart rate and systolic blood pressure are measured and studied. If there are no recurring stricture symptoms or signs and the 18 Fr catheter passed readily during urethral calibration during the follow-up period, the surgery is considered successful. From June 2021 to August 2022, total 36 patients, 18 from each group were assessed. In terms of mean age, length, location and type of strictures, as well as preoperative blood pressure and pulse rate, the patients in both groups were comparable. The age range of the patients was 23-78 years, with a mean (±SD) of 39.7 (±13.6) years. The stricture lasted an average of 15.7 months (median 12 months, range 6-57 months) in group I and 17.1 months (median 15 months, range 9-59 months) in group II. Idiopathic stricture accounted for 47.2% of the total number of patients (17 individuals) in both groups. Nine patients, or twenty-five percent, had inflammatory strictures. The preoperative examination of both research groups showed identical baseline pulse rates, systolic blood pressure, post void residual volume and maximum flow rate (Qmax) on uroflowmetry (Fig. 1). In Group 1, the average baseline pulse rate was 76.2 (±8.3) beats per minute, whereas in Group 2, it was 78.5 (±7.6) beats per minute. For Group 1 patients, the mean baseline systolic blood pressure was 124.7 (±12.3) mm Hg, while for Group 2 patients it was 126.3 (±9.3) mm Hg. For every patient in both groups, an internal urethrotomy with direct visualization was finished. The intraoperative VAS scores of patients in groups 1 (2.6±1.24) and 2 (2.664±1.36) did not exhibit statistical significance in terms of mean (±SD). Additionally, there was no significant difference in the mean 1-hour postoperative VAS score (1.6±1.12) between group 1 patients and group 2 patients (1.72±0.87) (p-value is 0.78).Preoperative vs. maximal perioperative pulse rate changes were not statistically significant in groups 1 (7.82±3.8 beats/min) or 2 (7.5±4.4 beats/min, P-value >0.05). Additionally, there was no significant difference in the systolic blood pressure between groups 1 (8.24±4.2 mm Hg) and 2 (8.6±4.7 mm Hg, p-value is >0.05). All patients were discharged on first post -operative day. The foley catheter was removed after 5 days except for one patient in each group who were developed urinary extravasation (Clavien-Dindo Grade 1). After seven days, the catheter was taken out while they received conservative care. There were no issues linked to the anesthesia. 14 months was the median follow-up time (range: 3-26 months). Two patients in Group 1 had recurrences during follow-up. Three patients in group 2 had urethral stricture recurrence. There was no difference in the recurrence of stricture between the two groups according to the Kaplan-Meier survival analysis (p = 0.423). DVIU (n = 2), anastomic urethroplasty (n = 2) and buccal mucosal graft augmentation urethroplasty (n = 1) were used to treat recurrence strictures. The most often used endoscopic method for treating short segment urethral strictures up to 2 cm in length is called directly visualized internal urethrotomy (DVIU). Pain management during DVIU operations can be achieved safely and effectively using both percutaneous periurethral intracorpus spongiosum block and intracorpus spongiosum block via glans penis. When considering DVIU, percutaneous intracorpus spongiosum block and periurethral intracorpus spongiosum block should be done due to their shown safety and effectiveness, especially in individuals who are at high risk for general or regional anesthesia.

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Key Words
Directly visualised, Internal urethrotomy, local anesthesia, Percutaneous, urethral stricture, intracorpus-spongiosum

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INTRODUCTION

A somewhat frequent condition, urethral stricture is more common in developing nations. The most prevalent causes of strictures include blunt perineal trauma, urological instrumentation, road traffic accidents with fractured pelvis, chronic inflammatory illnesses such lichen sclerosus et atrophicus (BXO) and sexually transmitted infections, a significant number are iatrogenic[1]. It leads in blockage of the urinary system, which can lead to a variety of clinical manifestations, including renal failure and urinary tract infections. Currently, open urethroplasty, directly visible internal urethrotomy and dilatations are the available treatments for urethral strictures[2]. The kind, duration, depth and aetiology of strictures determine the available treatment choices. In daily clinical practice, dilations are simple to do but the outcomes are unsatisfactory due to high recurrence rates. With the highest success rates (90-95%), open anastomotic urethroplasty exhibits the most promising and satisfactory outcomes. Despite being the gold standard at the moment, it necessitates a higher investment of time, money, skills, knowledge and equipment. For strictures less than 2 cm, with no preoperative intervention and with little spongiofibrosis many urologists recommend Directly Visualized Internal Urethrotomy (DVIU) as the initial therapeutic choice. This surgery is often carried out under general or spinal anesthesia[2]. Topical anesthesia, spongiosum block, transperineal and urethrosphincteric have all been employed with different kinds of local anaesthetic procedures; however, none of these approaches have been widely accepted[3-10]. Owing to the brief duration of the surgery and its frequent use in endourological treatments, efforts to develop a less invasive, straightforward, affordable, efficient and workable anesthetic method will persist. Even with DVIU's initial high success rate, the recurrence rate varies between 5 and 50% following a lengthy follow-up. Numerous variables, including preoperative infection, catheter usage, patient age, lesion location, stricture length and periurethral scarring, are predictive of the stricture recurrence rate following DVIU. In the current study, we contrast the safety, success rate and efficacy of DVIU via subcutaneous periurethral intracorpus spongiosum block with percutaneous intracorpus spongiosum block in terms of pain relief.

MATERIALS AND METHODS

From December 2022 to February 2024, the study was carried out in the urology department of the RG Kar Medical College and Hospital. The eligibility requirements for all adult patients with a single anterior urethral stricture up to 2 cm in length who were scheduled for DVIU as a therapy for their urethral stricture were evaluated. The aetiology of stricture and related comorbidities were determined by a thorough history and clinical examination. There were tests performed on blood biochemistry, coagulation profiles, urinalysis and cardiovascular and pulmonary function. Using retrograde urethrogram (RGU), micturating cystourethrogram (MCU) and uroflowmetry, the stricture's length, position, depth and viability were evaluated. The study excluded patients with urethral malignancy, multiple or complex strictures, stricture of the fossa navicularis, stricture length greater than 2 cm, history of prior operative intervention, known allergy to lignocaine, uncorrected coagulopathy and neurological and cardiovascular comorbidities. Participants gave written informed permission before being randomly assigned to one of two groups consisting of eighteen patients each. Using a 26 G hypodermic needle, Group I participants had a gradual injection of 5 ml of 1% lignocaine into the dorsal glans penis (ICSB) over the course of a minute (Fig. 1). To avoid the quick loss of anesthetic agent into the systemic circulation through the penis's dorsal vein, a rubber band was placed over a single layer of gauze covering the base of the penis. The glans was pressed for one to three minutes using a swab to prevent bleeding. Group 2 patients had the stricture location noted externally in the perineum during the guide wire passage. A 24 G hypodermic needle was used to inject 5 mL of 1% lignocaine percutaneously around the stricture and the patients received mild massage therapy (Fig. 2). Subcutaneous injection of a local anesthetic solution at the three and none o'clock positions into the peri-urethral area. The precise injection location can be identified by using a cystoscope held at the stricture level to illuminate the penile or perineal skin. Anywhere along the anterior

Fig. 1: Intracorpus spongiosum block technique

Fig. 2: Subcutaneous periurethral intracorpus spongiosum block

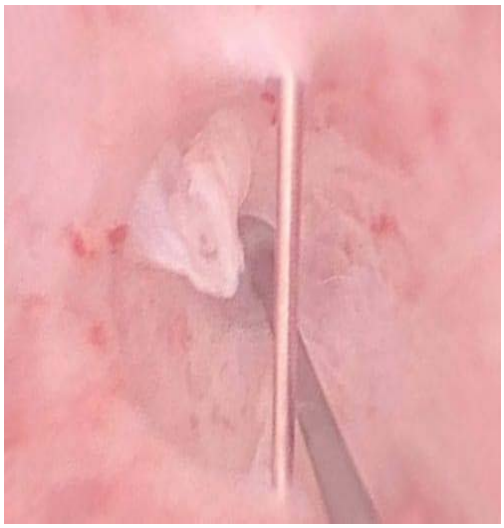

Fig. 3: Subcutaneous periurethral intracorpus spongiosum block at 12 0’ clock position

urethra that is accessible subcutaneously can be used for short segment strictures with this technique. Deeper infiltration is required to provide anesthesia since the majority of the urethrotomy is done at the twelve-o'clock position and the urethrotomy must be continued deeply into scar tissue both proximal and distal to the stricture. The same needle is used to enter the urethral lumen from the six o'clock position while the endoscope is viewing it, using the trans-illumination of the scope as a guide. Under endoscopic guidance, a local anesthetic is injected into the stricture at the twelve o'clock position both proximally and distally using a needle that has entered the lumen (Fig. 3). VIU sheath was introduced using 2% lignocaine gelly in both groups. The patient was in the lithotomy position during every surgery. The administration of injection gentamycin 80 mg IM/IV was done before to operations. Using a Storz 21 Fr cold cutting urethrotome and a 0.035-inch guide wire, a single 12-o'clock incision was made across the stricture until the whole thickness of the fibrous scar was separated and normal tissue was reached above and below the stricture. The stricture is fully incised once the 21 Fr sheath is easily inserted into the bladder. For 5-7 days, an 18 Fr Foley catheter was kept in place. Blood pressure and pulse rate were recorded before to, during and following the surgery. During the first hour following surgery, the patient's pain was measured using the visual analog scale (VAS). The VAS has ten possible scores: 0 indicates no pain and 10 indicates the highest level of discomfort. Systolic blood pressure and the immediate preoperative and postoperative pulse rates were recorded. As an objective measure of the sympathetic response to pain, the rise in pulse rate (preoperative and maximum perioperative pulse rate) and changes in systolic blood pressure (preoperative vs. maximum perioperative systolic blood pressure) were noted and compared for each patient. Anaesthetic complications and perioperative DVIU up to 30 days after surgery were documented and categorized using the Clavien-Dindo Classification system. Every patient had a follow-up after one month, then every three. Utilizing an 18 Fr Foley catheter for urethral calibration and uroflowmetry, patients are assessed. Any return of symptoms, low uroflowmetry flow rate and /or incorrect urethral catheter calibration with an 18 Fr Foley catheter all required a retrograde urethrogram. For three to twenty-six months, patients were monitored.

In terms of continuous data, the mean (±standard deviation, SD) was used. The independent t-test or Mann-Whitney U test, if appropriate, was used for continuous data and the Chi-square test for categorical data when conducting a comparative study between two groups. Every typical test has two tails. If a P value was less than 0.05, it was deemed statistically significant. SPSS software for analysis (version 20, IBM Corporation, NY, USA) was used for all analyses.

RESULTS

There were 36 patients evaluated in all, 18 in each group, between December 2022 and February 2024. The mean age, duration of symptoms, preoperative blood pressure, preoperative pulse rate and the location, kind and length of the strictures were all identical among the patients in both groups. The patients' ages ranged from 23-78 years, with a mean (±SD) of 39.7 (±13.6) years. The stricture lasted

Table 1: Preoperative characteristics of both groups

Variables	Group 1s	Group 2
No. of patients	18	18
Age (years) (range)	41.7 (±13.6) years (range 23-78 years)	39.2 (±11.9) years (range27-72 years)
Duration (month)	15.7 months (median 12 months, range 6-57 months)	17.1 months (median 15 months, range 9-59 months)
Stricture length (cm)	1.1±0.5	1.3±0.5
Type (n)		
Primary	18	18
Recurrent	2	3
Etiology (n)		
Idiopathic	8	9
Inflammatoyr	5	4
Traumatic	3	2
Iatrogenic	2	3
Stricture location (n)		
Penobulbar	3	4
Mid-bulbar	11	12
Proximal bulbar	3	3
Preoperative Qmax (mL sec^{-1})	6.7±3.2	.1±3.7
Pre-PVRU(ml)	123.5±61.7	135.8±72.7
Preoperative pulse (rate/min)	76.2(±8.3) per min	78.5 (±7.6) per min
Preoperative SBP(mmHg)	124.7 (±12.3) mm Hg	126.3 (±9.3) mm Hg
Change in intraoperative	7.82±3.8 beats min	7.5±4.4 beats/min pulse rate (rate min^{-1})
Change in intraoperative SBP (mmHg)	8.24±4.2 mm Hg	8.6±4.7 mm Hg
Intraoperative VAS	2.6±1.24	2.64±1.36
1 hr postoperative VAS	1.6±1.12	1.72±0.87

15.7 months on average (median 12 months, range 6-57 months). In both groups, the majority of patients (17 individuals) had an idiopathic stricture (47.2%). Nine patients, or 25%, had inflammatory strictures. Both research groups' preoperative assessment baseline pulse rate, systolic blood pressure, post-void residual volume and maximum flow rate (Qmax) on uroflowmetry were comparable (Table 1). In Group 1, the average baseline pulse rate was 76.2 (±8.3) beats per minute, whereas in Group 2, it was 78.5 (±7.6) beats per minute. For Group 1 patients, the mean baseline systolic blood pressure was 124.7 (±12.3) mm Hg, while for Group 2 patients it was 126.3 (±9.3) mm Hg. For every patient in both groups, an internal urethrotomy with direct visualization was finished. The intraoperative VAS scores of patients in groups 1 (2.6±1.24) and 2 (2.664±1.36) did not exhibit statistical significance in terms of mean (±SD). Additionally, there was no significant difference in the mean 1 hr postoperative VAS score (1.6±1.12) between group 1 patients and group 2 patients (1.72±0.87) (p-value is 0.78). Preoperative vs. maximal perioperative pulse rate changes were not statistically significant in groups 1 (7.82±3.8 beats/min) or 2 (7.5±4.4 beats/min, p>0.05). Additionally, there was no significant difference in the systolic blood pressure between groups 1 (8.24±4.2 mm Hg) and 2 (8.6±4.7 mm Hg, p>0.05). The first postoperative day saw the release of every patient. Until the catheter was taken out, oral antibiotics were administered. With the exception of one patient in each group who experienced urine extravasation (Clavien-Dindo Grade 1), the foley catheter was withdrawn after five days. After seven days, the catheter was taken out while they received conservative care. There were no issues linked to the anesthesia.

14 months was the median follow-up time (range: 3-26 months). Two patients in Group 1 had recurrences during follow-up. Three patients in group 2 had urethral stricture recurrence. There was no difference in the recurrence of stricture between the two groups according to the Kaplan-Meier survival analysis (p = 0.423). DVIU (n = 2), anastomic urethroplasty (n = 2) and buccal mucosal graft augmentation urethroplasty (n = 1) were used to treat recurrence strictures.

RESULTS AND DISCUSSION

In order to treat urethral strictures, Sachse developed direct vision internal urethrotomy (DVIU), a cold-knife incision[11]. DVIU is an endoscopic treatment that is still widely used for single and short segment anterior urethral strictures with minimum or no spongiofibrosis since it is minimally invasive, simple, quick, easy, affordable and has reduced morbidity. Additionally, doing DVIU under spinal or general anesthesia raises the entire cost of the treatment significantly and necessitates the attendance of a qualified and experienced anesthesiologist. Numerous local analgesic treatments have been used to address this issue. Under local anesthesia and in environments with few resources, it can even be carried out on patients who are not surgically fit. Success rates do, however, differ and long-term success rates are often poor. Success rates are between 70 and 80% in the short term (less than 6 months). However, after a year, recurrence rates start to reach 50-60% and by five years, they vary from 74 to 86%[12]. The blockage of cavernosal nerves, which are typically located in the proximal urethra between the o'clock of three and nine, is the anatomical foundation of the percutaneous peri-urethral corpus spongiosum local anesthetic

treatment. The urethral submucosal plexus of nerves along the urethra is made anesthetic by the intraurethral anesthetic gel. In addition, the cavernosal nerves in the distal urethra, which are situated at positions one and eleven o'clock, are blocked by a direct injection into the stricture at 12 o'clock[13]. In DVIU, Ye and Rong-gui in 2002 reported a novel anesthetic procedure known as "intracorpus spongiosum block." The male urethral anatomy serves as the foundation for the spongiosum block procedure. The corpus spongiosum, venous sinusoids and urethral epithelium make up the anterior urethra. The corpus spongiosum enlarges to create the glans penis at the distal end. The anesthetic drug, lignocaine, quickly anesthetizes the dermal nerve endings throughout the anterior urethra by slowly spreading via the venous sinuses after being injected subcutaneously into the syncytium of the spongiosum of the glans. Intracorpus spongiosum anesthesia has an instant anesthetic effect. Nineteen patients (95.7%) reported being pain-free. One patient had mild but bearable discomfort as the tissue above the stricture was being sliced. The anesthetic's effects were quite excellent and lasted anywhere from 30 min to 2 hrs (on average 1.5 hrs), no issues occurred[14]. Subsequently, he explained how this anesthetic may be economically employed in outpatient settings for further modest anterior urethral surgeries[15]. When ICSB and general anesthesia were used for DVIU, Ather *et al*.[15] demonstrated that the new method was just as useful and effective. Malleswari *et al*.[16] study examined the safety and efficacy of intracorpus spongiosum block in individuals at high risk for DVIU. We contrasted percutaneous peri-urethral intracorpus spongiosum block with intracorpus spongiosum block in our study. In both groups within our research population, all of the strictures were situated in the penobulbar junction or the bulbar urethra. In all groups, idiopathic strictures accounted for the majority of the strictures, followed by inflammatory and traumatic strictures. We were able to complete the surgery in every patient in our trial, demonstrating the efficacy of both approaches. Because percutaneous peri-urethral Intracorpus spongiosum block and intraoperative intracorpus spongiosum block had similar analgesic effects, the intraoperative and post-operative VAS scores in both groups were not statistically significant. There were objective data as well, as indicated by the fact that there was no significant difference in the change in pulse rate and systolic blood pressure in both groups, in addition to the subjective evidence of similar analgesic impact of intracorpus spongiosum block and percutaneous peri-urethral intracorpus spongiosum block. Anesthesia-related complications were not experienced. Two patients in Group 1 had recurrences during follow-up. Three patients in group 2 had urethral stricture recurrence. There was no difference in the recurrence of stricture between the two groups according to the Kaplan-Meier survival analysis (p = 0.423). DVIU (n = 2), anastomic urethroplasty (n = 2) and buccal mucosal graft augmentation urethroplasty (n = 1) were used to treat recurrence strictures. Technical and anatomical criteria, such limited vision during the operation and stricture length, are universally acknowledged as predictors of recurrence, despite the fact that different studies have indicated alternative etiologies as poor responders to DVIU[17]. The presence of periurethral fibrosis (spongiofibrosis), stricture etiology and perioperative urinary infection are additional variables linked to treatment failure. Extremely thin, convoluted urethras and the absence of any apparent orifices on their faces make them vulnerable to urethral damage, false passage and the formation of fistulas. Damage dramatically raises the likelihood of recurrence (from 28% in the undamaged state to 72% in the wounded state), necessitating further operations[18]. Additionally, it has been demonstrated that the stricture duration and treatment failure are directly correlated. Pansadoro and Emiliozzi showed that strictures bigger than one centimeter had a high recurrence rate. In their investigation, the success rate for strictures less than 1 cm was 71%, whereas the rate for strictures more than 1 cm was 18%[19]. In one trial, DVIU was performed on 33 patients who had urethral strictures using intraurethral 20 mL of 1% lignocaine gel in addition to 50-75 mg of intravenous pethidine. 70% of these patients developed corpora spongiosum-related thick stricture. It had a minimal complication rate and was very well tolerated (average VAS: 2/10). Merely 6 patients provided a VAS score greater than 3 out of 10. Nine individuals said they had no pain during the procedure. There was a 91% success rate[20]. With topical anesthesia using lignocaine, DVIU demonstrated comparatively lower success in 1993, with an 83% success rate[3]. On the other hand, it was reported in 2007 that 92.9% of patients with small stricture length were successfully treated with DVIU using topical lignocaine anesthesia. The study found no statistical significance in the mean (±SD) intraoperative VAS ratings for patients in groups 1 (2.6±1.24) and 2 (2.64±1.36). Additionally, there was no significant difference in the mean 1-hour postoperative VAS score (1.6±1.12) between group 1 patients and group 2 patients (1.72±0.87) (p-value is 0.78). Later, in a prospective research, 43 patients had DVIU while receiving topical administration of a eutectic combination of local anesthetic 15 min before to intracorpus spongiosum block to lessen injection discomfort, along with intracorpus spongiosum

anesthesia (3 milliliters of 2% lignocaine). In ninety-one cases, the surgery was successful. Patients' reported VAS values ranged from 0-4, with an average of 1.6[21]. The first randomized controlled study comparing intraurethral lignocaine alone and concomitant spongiosum block in DVIU for anterior urethral strictures was reported by Kumar *et al*.[22]. With respect to pain, the first group's mean VAS score was considerably lower than the second's (1.5±1.4 vs. 2.7±1.8, p = 0.006). Recurrence rates during the 6-month follow-up were higher in the second group (3/25 vs. 5/25)[22].

CONCLUSION

The most often used endoscopic method for treating short segment urethral strictures up to 2 cm in length is called direct visualized internal urethrotomy (DVIU). Both percutaneous periurethral intracorpus spongiosum block and intracorpus spongiosum block via glans penis are safe and equally effective methods for relieving discomfort during DVIU operations. Percutaneous intracorpus spongiosum block and periurethral intracorpus spongiosum block should be done if DVIU is being considered, especially in patients who are at high risk for general or regional anesthesia, due to their established safety and effectiveness.

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