Original Article

Comparison of Two Maneuvers of Local Steroid Usage After Optical Urethrotomy With Optical Urethrotomy Alone For Treatment of Bulbar Urethral Stricture

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Abstract

Background: Male urethral strictures are challenging and complex problems in urological practice. It may lead to serious complications of disastrous sequences in the renal system. It is characterised by its high recurrence rates after intervention. **Objectives:** Our aim was to study and analyse the outcomes of two auxiliary techniques of local steroid usage (local installation of ointment in the urethra during CIC and needle injection inside the stricture) after optical urethrotomy to reduce the recurrence rate of bulbar urethral stricture and delay the time to recurrence and compare them with optical urethrotomy alone. **Methods:** A prospective comparative study that was conducted between Sep 2019 and Oct 2023 and included a total of 64 male patients aged 18-60 years, who were recently diagnosed with bulbar urethral stricture of up to 20 mm involving the bulbar urethra. Idiopathic, inflammatory, and traumatic strictures were included. Our cases were sub-grouped into three main groups (group A, 22 cases; group B, 15 cases; and group C, 27 cases). All groups underwent cold knife optical urethrotomy; a triamcinolone intralesional injection was done in Group A, and self-CIC using intraurethral triamcinolone ointment (for a minimum duration of 6 months) was done in Group B. These patients were re-evaluated and followed up clinically for 24 months. Flexible urethroscopy and/or retrograde urethrogram 6-monthly for all patients during the first year, selectively thereafter if there were obstructive voiding symptoms or difficulties in CIC. **Results:** Significant reduction in re-stricture rate was reported in group A in comparison to groups B and C (18.2 vs 26% and 44% in sequence) ($P<0.05$). The average time to recurrence was also objectively much longer in the therapeutic group than in the control one (10.4 months and 9.5 months vs 6.5 months, respectively) ($P<0.0001$). The Qmax was obviously higher in the triamcinolone groups (17.5 ± 4.4 ml/second and 15.1 ± 4.7), compared to the control (12.2 ± 4.2 ml/second), which was statistically significant. The age of patients with recurrence was significantly older in therapeutic groups than in the control (42.5 years vs 38.6 years vs 33.5 years, respectively). The mean stricture length was objectively longer in triamcinolone groups (16.7 mm and 13.9 mm vs 12.9 mm, respectively) in patients with recurrence ($P < 0.0001$). **Conclusion:** Intralesional steroid injection and steroid installation during CIC were superior to native optical urethrotomy in decreasing urethral stricture recurrence after two years of follow-up, with minimal additional complications. Steroid injection techniques carry the highest success rate over urethral steroid dilation.

Keywords: Urethral Stricture, Triamcinolone, Optical Urethrotomy, Clean Intermittent Catheterization, Intralesional Injection.

Introduction

Male urethral strictures are a common and very well-known medical problem from old centuries. Its complex and challenging nature makes it poorly managed in most instances. It is a fibrotic disorder of the urethral wall that follows urethral mucosal damage with a subsequent series of pathological changes due to a reactive inflammatory healing process involving the mucosa, submucosa and underlying surrounding tissues, including the corpus spongiosum, which results in fibrotic cicatrisation that contracts to narrow the lumen of the urethra. Pathogenesis is mainly due to severe invasion by fibroblasts and excessive laydown of collagen in the wall of urethral and periurethral tissues owing to the high vascularity and active healing properties of periurethral tissues.[1] Secondary compensation for bladder outlet obstruction occurs at the level of the bladder neck, bladder detrusor muscles, and even the upper urinary tract due to the high voiding pressure that may transfer to the ureters and kidneys, leading to destructive changes and renal impairment. These pathological changes may be completely asymptomatic for a long time or cause progressive lower urinary tract symptoms starting with obstructed voiding symptoms and irritative symptoms with some features due to complications of urethral strictures such as active urinary tract infections (including cystitis, prostatitis, epididymitis and pyelonephritis), haematuria, stone formation, abscess formation or urethrocutaneous

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fistula. In addition to these pathological sequelae, it affects the quality of life and job performance and creates a significant financial burden on the patients and health resources due to its tendency for frequent recurrences after treatment. [1]

Urethral stricture is a well-known common urological disorder, with an incidence of 250-650 cases per 100,000 in the general population. The affected peak age was 45 years old. The anterior urethra is the most involved part and consists of 92% of all cases, with a predominant site being the bulbar urethra, which forms 47% of cases.[2, 3] Iatrogenic instrumental traumatic aetiology is the major cause in highly developed countries, with a wide range of 30% to 80%. This is followed by infectious inflammatory causes, mainly sexually transmitted infections (STDs) of the urethra, such as gonorrhoea and chlamydia, and blunt external trauma, typically falling astride. Other less common reasons include congenital stricture, lichen sclerosus xerotica obliterans, and, in a good percentage of cases, no underlying cause is found (idiopathic).[2-4]

The diagnosis of bulbar urethral stricture is suggested in patients younger than those with benign prostatic hyperplasia (BPH) with complaints of lower urinary tract symptoms, especially obstructive symptoms or recurrent infections, characteristically epididymitis and prostatitis. Older men with a poor response to medical treatment for BPH. Suggestive previous history of STD, perineal trauma, and instrumentation. The workup investigations included urinalysis, urine culture, renal function tests, and transabdominal ultrasound for kidneys, bladder wall and urine volume, prostate and post-void residual urine volume. Uroflowmetry is highly beneficial in supporting the diagnosis of long voiding times, low flow rates and long, flat, and low-amplitude plateau voiding curves. The diagnostic test of choice is dye study by retrograde urethrography and office flexible urethroscopy. Doppler ultrasound of the penile shaft for urethral and corporal changes is emerging as a beneficial test for assessing spongiofibrosis density of urethral stricture and quality of surrounding tissues.

The mainstay of treatment is surgical rather than medical, which only benefits the palliation of stricture complications. Surgical treatment depends on stricture and patient factors such as stricture site, length, density, multiplicity, aetiology, and complexity, in addition to patient performance status, renal function, and comorbidities. This is performed in a step-leader fashion to minimise morbidity and complications. The less invasive is dilatation by blind techniques for short and thin ones using a sound bougie or filiform and follower dilators. Visualised endoscopic internal urethrotomy using a cold or hot knife and laser incision is the preferred initial option in most cases. However, it has only a 20% overall success rate, with a recurrence rate of up to 90% within the first year after treatment.[5] However, this success rate may be enhanced with more than one urethrotomy attempt, although this is not agreed upon by some authors. Up to three attempts of urethrotomy are the standard approach, and any recurrence after that means I should move to the next step, which is formal surgical urethroplasty, which has a cure rate of more than 90%. However, this major intervention is a highly sophisticated technique and demands experience, with an elevated rate of complications and not always feasible with significant morbidity and very high cost.[5] Although open reconstructive procedures have very high success rates, they are much more invasive in comparison to the endoscopic approach. Furthermore, when compared to endoscopic interventions, reconstructive procedures require a specialised centre with a high annual workload and a very high level of surgical training and expertise from urosurgeons, which are not always available, and because of the lengthy procedure, they can be unsuitable for a frail group of patients of old age with associated comorbidities in people with urethral stricture disorder.[4]

The principle of endoscopic optical internal urethrotomy is that it works to separate and incise the scarred fibrotic epithelium to enhance healing by secondary intention of an intentionally created wound in an effective manner to prevent contraction of a secondary scar and re-stenosis, but re-approximation of the epithelium is not provided by urethrotomy. Therefore, the long-term success rate of optical internal urethrotomy will only be obtained if the epithelialisation process progresses before contraction of iatrogenic wounds induced by urosurgeons during endoscopy; otherwise, inevitable recurrence of stenosis is the standard.[6] Therefore, optimisation of current endoscopic urethrotomy procedures is necessary. The complications of endoscopic optical urethrotomy are minimal and may include some limited adverse events such as contracted infections, urethral bleeding, and urinary extravasation at a low frequency rate.[7]

The fact that the long-term success rate of single optical urethrotomy is not high (nearly 8%) and the controversy about the success rate of subsequent urethrotomies, which may further decrease or may minimally increase the stricture stabilisation rate. For these reasons and to enhance the success rate of optical urethrotomy, many supplementary strategies have been suggested.[6-8] By returning to the proven hypothesis, which claims that the excessive deposition of collagen and glycosaminoglycan synthesis and expression of inflammatory mediators by invading fibroblasts during the inflammatory healing reaction and alteration in the extracellular matrix composition are the proposed mechanism in the urethral stricture pathophysiology.[9] Many researchers have studied and analysed the effectiveness of multiple classes of antifibrotic medications (more than 10 substances were studied) over the last 30 years during the manipulation of urethral strictures, such as metalloproteinase-1, rapamycin, somatostatin analogues, mitomycin C, botulinum toxin A, halofuginone, hyaluronic acid, carboxymethylcellulose, N-acetyl cysteine, platelet-rich plasma, paclitaxel and corticosteroids (triamcinolone

or prednisolone), and all showed positive effects on urethral stricture recurrence rates.[10-15] Many studies have concluded that glucocorticoid-based drugs were proposed to reduce collagen deposition in the treatment of wound scar tissues[16], and this reinforces the idea in the minds of many urologists to re-try the use of steroid-based solutions based on a few trials that had been conducted by some urologists during the 1960s[17] and 1970s[18, 19] to prove their efficacy in increasing the success rate of urethral stricture treatment. Furthermore, several complementary manoeuvres have been suggested to optimise endoscopic intervention and reduce stricture recurrence rates, such as long-lasting indwelling Foley catheters, intermittent self-dilation (CIC) with or without intraurethral application of antifibrotic local drugs, and urethral stents. However, definitive solid evidence is still lacking in the previous literature.[20]

The pioneers of the local use of corticosteroids in decreasing urethral scar formation and restructuring were Göthlin G and Akerlund E in 1965[17], who confirmed some benefits of using hydrocortisone. A few years later, Hebert PW, in two studies in 1971 and 1972, documented the efficacy of using triamcinolone local injection.[18] Later, steroid local application was also studied by several authors, including Sharpe JR and Finney RP in 1976[19] and Gaches CG and his colleagues in 1979[21], who reported encouraging results with corticosteroid local injection, mainly triamcinolone solution. After that, Abourachid et al. strongly recommended intralesional corticosteroid injection as a good choice to increase the effectiveness of optical urethrotomy and reduce the urethral re-stricture rate[22], but there are a very deficient number of studies supporting the steroid role in treating stricture diseases of the urethra during the next two to three decades in the 1980s and the 1990s.[23] Triamcinolone decreased spongiofibrosis by enhancing collagenase production and reducing collagenase inhibitor levels and therefore inhibiting the synthesis and lay down of collagen fibres.[24] Meanwhile, glucocorticoid derivatives are extensively used to treat skin hypertrophied scars, keloids, and esophageal mucosal strictures, and triamcinolone was very effective in reducing scar tissue and fibrosis.[9, 16, 25] In the last decade, this subject has been studied extensively but with a limited number of cases in each study, and roughly, it has become a standard to use steroid drugs as adjuvant therapy after endoscopic urethrotomy in advanced countries.[20] Kurt *et al*.[26] corroborate with the above-mentioned papers when they reported that local triamcinolone has reduced the re-stricture rate significantly.[26] Even oral steroids have been tried in several studies and have provided acceptable results in reducing stricture recurrence.[27, 28]

The objective of our study is to analyse and compare the outcomes of two supplementary manoeuvres of local steroid usage (local instillation of ointment in the urethra during CIC and needle injection of solution inside the stricture) after optical urethrotomy aimed at reducing the very high stricture recurrence rate of native optical urethrotomy and delaying the time to recurrence.

Material and Methods

Our prospective cohort study was carried out in a single urology centre over a period of 4 years between September 2019 and October 2023. Our sample of patients included a total of 80 males initially, but 5 of them were excluded after endoscopy due to the discovered complex nature of their stricture, and 11 of them were lost from completion of the minimum 12-month follow-up period of the study, and 64 cases were followed to the end of the study and included, as shown in Figure 1. Our patients aged between 18 and 60 years, who presented with newly diagnosed bulbar urethral stricture based on a constellation of obstructive voiding symptoms such as hesitancy, postvoid dribbling, intermittency, weak stream, and feeling of incomplete bladder emptying with or without dysuria, haematuria, or recurrent urinary tract infections, including chronic prostatitis. Patients initially underwent measurement of post-void residual urine volume using trans-abdominal ultrasound with maximum flow rate using uroflowmetry. The standard diagnostic tests were retrograde urethrography and/or flexible office urethroscopy. A well-prepared questionnaire was printed containing demographic and personal contact data, details of medical and urological history, our parameters studied, and any future complications suspected. A detailed informed consent was taken from the patients and a formal written agreement signed by patients for inclusion in the study. Inclusion criteria included males aged 18-60 years with native bulbar urethral strictures of up to 20 mm resulting from inflammatory, traumatic (straddle injury and post-instrumental) or idiopathic causes. I excluded patients younger than 18 years and older than 60 years, in addition to those with penile and posterior urethral stricture, stricture longer than 20 mm, multiple strictures (more than 3), complex strictures that ultimately will require urethroplasty, lichen sclerosus xerotica obliterans, and strictures induced by penetrating external trauma. All the patients were electively scheduled for optical urethrotomy using a cold knife under general or regional anaesthesia with prophylactic antimicrobial administration on induction. The 21 French urethrotome was used by a single surgeon with incision of the stricture deeply at the 12 o'clock position on the dorsal aspect of the urethra until healthy tissue was revealed, followed by dilatation of the urethra using sound dilators up to 28 French. A silicone Foley catheter of 16-18 French was indwelled in all cases for up to 5 days postoperatively. The patients were subgrouped into three main groups (group A, including 22 cases; group B, including 15 cases; and group C, including 27 cases). Groups A and B were termed steroid therapeutic groups, while group C referred to the control group. The first group underwent optical urethrotomy with triamcinolone intralesional injection at the end of the procedure, while the second group of

patients, after optical urethrotomy, was instructed to perform a CIC using intraurethral triamcinolone ointment with or without lidocaine gel as a lubricant for a minimum duration of 6 months. The third group underwent optical urethrotomy only without adjuvant treatment or CIC. The patients in group A underwent concomitant scar tissue submucosal injection at the time of urethrotomy, either immediately before incision or immediately after incision and dilation, using triamcinolone solution injection (40 mg/ml) at different stricture sides (minimally 4 quadrants) of up to one millilitre per one centimetre stricture length using a special INJETAC metallic Botox injection needle. While the patients in group B were taught to start performing CIC immediately after catheter removal with triamcinolone acetonide ointment 0.5% instillation inside the urethra with or without lubricant lidocaine gel 2%, using a Nelatone silicone catheter of 16 and 18 French for the next 6 months on a daily basis during the first fourteen days. Afterwards, during the second fourteen days after urethrotomy, CIC was done every other day. Later on, it's done twice weekly during the next month and on a weekly basis thereafter, as explained in Table 1. All patients were followed up for 12 to 24 months. During the first 12 months of the follow-up period, the patients were reassessed regularly every 3 months for any abnormal obstructive symptoms or problems during self-dilatation. Uroflowmetry, retrograde urethrography and/or flexible urethroscopy were performed at 6 and 12 months postoperatively and, according to patient complaints, dilatation problems or results of uroflowmetry (if needed) thereafter.

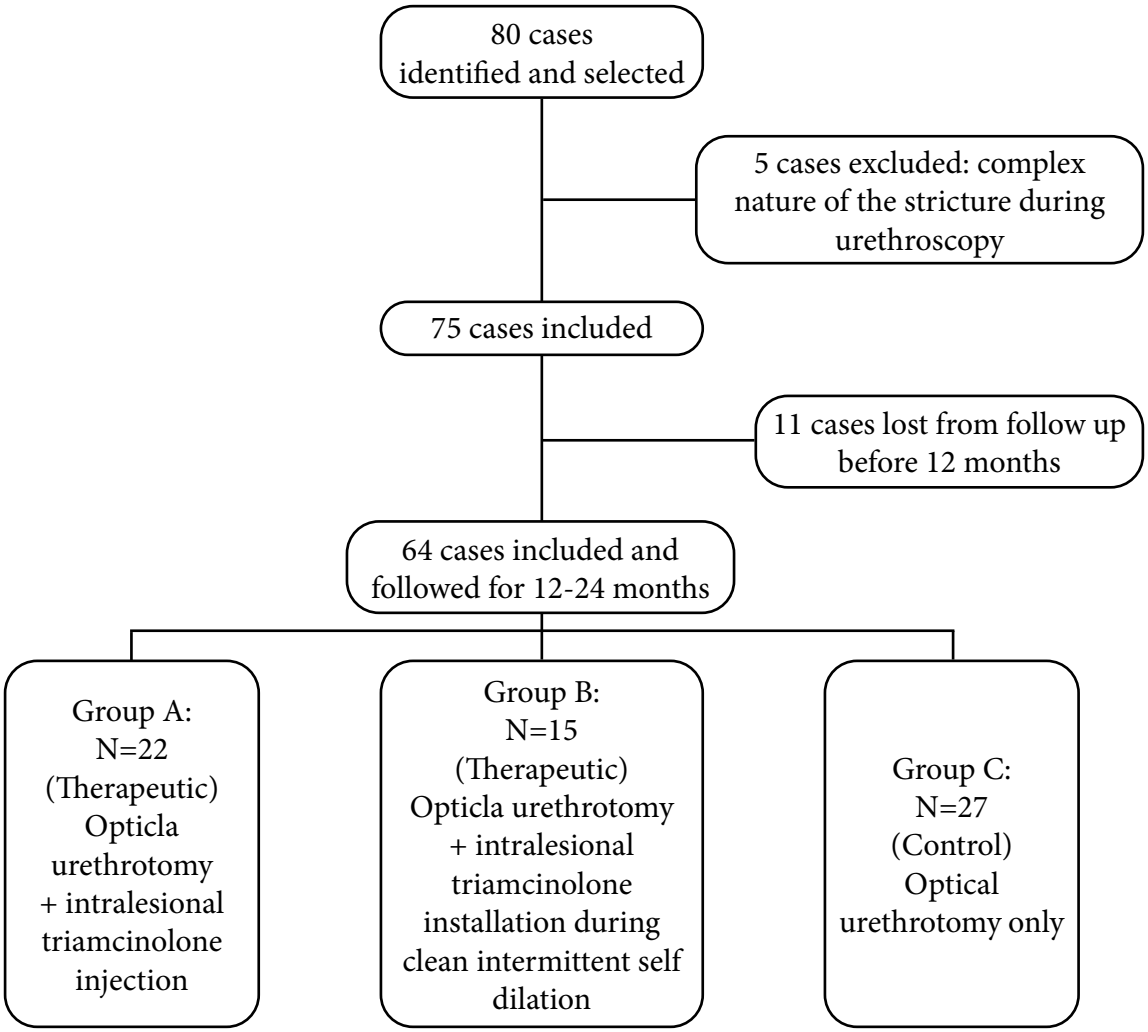

Figure 1: Flowchart of Patients Included in the Study and Grouping.

The main parameters that were analysed in this study were the stricture recurrence rate, the time duration to recurrence, the maximum flow rate (Qmax) at 12 months, the relationship between stricture length and the underlying aetiologies of stricture, and the age of patients and the recurrence rate. Statistical data were analysed, and continuous quantitative variables were illustrated as mean and standard deviation. The student t-test, Z-test, and chi-square test were used to compare the categorical variables. Statistical significance was set at P-value < 0.05.

Table 1: Schedule of CIC with Tamcinolone Ointment after Optical Urethrotomy.

Postoperative Time	CIC Schedule
First two weeks	daily
Second two weeks	every other day
Second month	twice weekly
3rd, 4th,5th, and 6th months	weekly

Results

About the demography, there was a wide range of patients' ages in our study, ranging from 18 to 60 years, with an average age of the total patients being 36.75 ± 9 SD years. The average age in group A (intralesional triamcinolone injection) was 40 ± 12 SD years, whereas it was 33.5 ± 2 SD years in group B (local triamcinolone ointment installation) and 35.9 ± 5 SD years in group C. There was no statistically significant difference of age between the steroid therapeutic groups (groups A and B) and the control group (group C) with the P-values = 0.113 and 0.083, respectively. Some significant age difference is observed between the two therapeutic groups with the P-value=0.046, as declared in Table 2. The average length of bulbar urethral stricture was 14.3 ± 6 mm in total patients of the study, with 15.5 ± 8 mm versus 14.5 ± 4 mm vs 12.9 ± 9 mm for group A, group B, and group C, respectively. There are no significant differences between the therapeutic group and control group with P-values of 0.296 and 0.518. Likewise, there are no statistical differences between the two therapeutic groups, P=0.658, as shown in Table 2. The underlying aetiologies for stricture disease for total patients of the study were inflammatory in 31 (48.4%) cases, traumatic in 24 (37.5%), and idiopathic in 9 (14%). In group A versus group B versus group C, the underlying reasons were inflammatory in 59% vs 47% vs 40.8%, traumatic in 31% vs 33% vs 44.4%, and idiopathic in 10% vs 20% vs 14.8% of cases, respectively, as illustrated in Table 2.

Table 2: Baseline Characters of Cases in The Triamcinolone Therapeutics Groups and The Control Group.

Characters	Total Sample N=64	Group A (Triamcinolone Injection) N=22	Group B (CIC Triamcinol-one Dilation N=15	Group C (CIC Dilation only) N=27	P-value*[1]
Mean age in Years	36.75 ± 9	40 ± 12	33.5 ± 2	35.9 ± 5	A&B =0.046 A&C =0.113 B&C =0.083
Mean Stricture Length in Millimeters	14.3 ± 6	15.5 ± 8	14.5 ± 4	12.9 ± 9	A&B =0.296 A&C =0.518 B&C =0.658
Etiology of Strictures:					
Inflammatory	31 (48.4%)	59%	47%	40.8%	NA*[2]
Traumatic	24 (37.5%)	31%	33%	44.4%	NA*[2]
Idiopathic	9 (14%)	10%	20%	14.8%	NA*[2]

*1P-value < 0.05 is considered statistically significant.
*2NA (not applicable)

All the results of the studied and analysed parameters and their relationship are explained in Tables 3 and 4. About our main parameter studied, the urethral stricture recurrence rate (re-stricture rate), it is defined by either symptomatic, uroflowmetric, radiological or endoscopic recurrence or if there is a need to repeat the endoscopic incision procedure. The total recurrence rate of all three groups was 31.25% (20 out of 64 total cases). In group A, the re-stricture rate was 18.2% (4 out of 22 cases); in group B, it was 26% (4 out of 15 cases); while in group C, it was 44.4% (12 out of 27 cases). Statistically, these differences were significant between all three groups when compared to each other with a P-value <0.05. The next important studied parameter is the duration from the time of incision to the time of recurrence, which was in the total study sample an average of 8.8 ± 0.8 SD months. In group A vs group B vs group C, the mean time was 10.4 ± 0.6 vs 9.5 ± 0.5 vs 6.5 ± 0.9 months, respectively. Statistically, there were highly significant differences between both therapeutic groups in comparison to the control one (P<0.0001) and between the therapeutic groups when compared to each other (P<0.0001).

The maximum flow rate (Qmax) at 12 months of the study was used to evaluate the results of uroflowmetry. The mean preoperative Qmax of all studied patients was 5.4 ± 7 mm/second. The mean Qmax that was obtained at 12 months in the total sample of the study was 15.1 ± 5 ml/second. Furthermore, the Qmax was 17.5 ± 4.4 ml/second, 15.1 ± 4.7, and 12.2 ± 4.2 for groups A, B, and C, respectively. Statistically, these results show high significant differences between the first therapeutic group A and the control group C (P<0.0006) and some significant differences between groups B and C (P=0.046), but they were not significant between groups A and B (P=0.0948). The relation of the age to recurrence rate shows that the average age of patients who had recurrence in all three groups in total was 38.2 ± 8.5 years. In group A vs group B vs group C, the mean age of recurrence was 42.5 ± 5 years vs 38.6 ± 7 years vs 33.5 ± 9 years, respectively. The relation of age to the recurrence rate was statistically highly significant between group A and group C (P<0.0001) and just significant between group A and group B (P<0.05), but not between group B and group C (P=0.065).

The mean stricture length in the recurrence group of patients in total was 14.5 ± 1.3 mm. The mean stricture length in those who developed re-stricture in group A vs group B vs group C was 16.7 ± 1.1 mm vs 13.9 ± 0.5 mm vs 12.9 ± 1 mm, respectively. Statistically these results were highly significant when comparing group A and group B to the

control group (P<0.0001 and P<0.0008, respectively) and highly significant within the therapeutic groups when compared to each other (P<0.0001). Regarding the aetiologies of strictures in recurrence groups of patients in total, it was inflammatory in 9 (out of 31 inflammatory strictures = 29%) cases, traumatic in 10 (out of 24 traumatic strictures = 41.6%), and idiopathic in 1 (out of 9 idiopathic strictures = 11%). In group A versus group B vs group C, the underlying causes in patients with recurrence were inflammatory in 2 (out of 13 = 15.3%) vs 2 (out of 7 = 28.5%) vs 5 (out of 11 = 45%); traumatic in 2 (out of 7 = 28.5%) vs 2 (out of 5 = 40%) vs 6 (out of 12 = 50%); and idiopathic in 0 (out of 2 = 0%) vs 0 (out of 3 = 0%) vs 1 (out of 4 = 25%), respectively. In the case of inflammatory causes, in patients with recurrence, when I compare these results between all three groups, some statistically significant differences were obtained (P<0.05). likewise in the traumatic strictures, in which the same statistical significance was reported (P<0.05), which has the higher recurrence rate in all three groups.

Table 3: The Recurrence Rate of Stricture, Time to Recurrence and Maximum Flow Rate of Study Groups.

Parameters	Total N=64	Group A N=22	Group B N=15	Group C N=27	P-value*
Recurrence Rate	20 (31.25%)	4 (18.2%)	4 (26%)	12 (44.4%)	A&B <0.05 A&C <0.05 B&C <0.05
Time to Recurrence in Months	8.8 ± 0.8	10.4 ± 0.6	9.5 ± 0.5	6.5 ± 0.9	A&B <0.0001 A&C <0.0001 B&C <0.0001
Qmax in ml/sec	15.1 ± 5	17.5 ± 4.4	14.9 ± 4.7	12.9 ± 4.3	A&B <0.0948 A&C <0.0006 B&C =0.046

*P-value < 0.05 is considered statistically significant

Table 4: The Age, Length of Stricture, and Underlying Etiologies of Stricture in Patients Who Developed Recurrence.

Characters	Total Recurrence Patients N=20	Group A (Triamcinolone Injection) N=4	Group B (CIC Triamcinolone Dilation N=4	Group C (CIC Dilation Only) N=12	P-value*[1]
Mean Age (years)	38.2 ± 8.5	42.5 ± 5	38.6 ± 7	33.5 ± 9	A&B =0.05 A&C <0.0001 B&C <0.065
Mean Stricture Length in Millimeters	14.5 ± 1.3	16.7 ± 1.1	13.9 ± 0.5	12.9 ± 1	A&B <0.0001 A&C <0.0001 B&C <0.0008
Etiology of Strictures:					
Inflammatory	9 (31) 29%	2 (13) 15.3%	2 (7) 28.5%	5 (11) 45%	A&B <0.05 A&C <0.05 B&C <0.05
Traumatic	10 (24) 41.6%	2(7) 28.5%	2(5) 40%	6(12) 50%	A&B <0.05 A&C <0.05 B&C <0.05
Idiopathic	1(9) 11%	0 (2) 0%	0 (3) 0%	1 (4) 25%	NA*[2]

*[1]P-value < 0.05 is considered statistically significant. *[2]NA (not applied)

Discussion

The outcome of our research declared that the re-stricture rate was highest in the third control group in comparison to the first two therapeutic groups but still higher in the second group in comparison to the first group and that the success rate was greater in cases of the intralesional injection of triamcinolone solution. About the time of recurrence after incision, I were able to conclude a highly significant positive effect of the intralesional injection of steroid in delaying the time to recurrence in comparison to the local installation during CIC and the urethrotomy only (control) group. I found the greatest improvement in Qmax with intralesional steroid injection, followed by local steroid dilatation, which was significantly higher than that of urethrotomy alone. Regarding the relationship between age and recurrence rate in people who developed re-restricting, our results show that the recurrence rate was higher in younger-age patients in the third control group in comparison to patients in the first and second therapeutic groups in whom the recurrence happened at a relatively older age.

Regarding stricture length in patients in whom the stricture has recurred, our data reflects that the recurrence occurred only in patients with relatively longer strictures in the first group in comparison to those in the second and third groups of patients in whom re-structuring happened in relatively shorter strictures. The relation of underlying aetiologies of stricture disease to recurrence rate suggests that inflammatory strictures are significantly less likely to recur than traumatic ones with adjuvant steroid application, especially during intralesional injection, and that the leading aetiology of stricture in all three recurrence groups of patients was traumatically induced stricture, with only one case of idiopathic stricture developing recurrence, which was within the control (urethrotomy alone) group. Sharpe and Finney reviewed ninety-six patients and followed them for more than twelve months after triamcinolone

solution injection inside the urethral lesion, and they concluded that intralesional steroid is particularly useful in strictures of the distal urethra and the meatus and in membranous strictures following radical prostatectomy and in some cases of post-urethroplasties , so they recommended that selected patients can benefit from using stricture injection.[1] Also, Hebert PW published a paper on 12 cases followed by a second paper on 50 symptomatic cases suffering from strictures in the bulbous, membranous, and pendulous urethra with a length range from 2.5 to 100 mm, with an overall encouraging success rate and the best result obtained if two sessions of triamcinolone injections are done a few weeks apart.[2] Mazdak H and colleagues documented that triamcinolone injection has improved stricture recurrence rate significantly after direct internal visualisation urethrotomy after up to 25 months of follow-up with a 22% recurrence rate in comparison to 50% in the non-triamcinolone group.[29] A double-blind, randomised, placebo-controlled study was performed on seventy patients who received a triamcinolone acetonide injection or an injection of sterile water after internal urethrotomy. Postoperatively, non-significant minimal complications happened, including infection, bleeding and extravasation. In the experimental group, the recurrence rates were less than in the counterpart group, but this difference was not statistically significant. On the other side, the average time to recurrence objectively reduced in the triamcinolone group, and this was statistically significant.[30] All these above-mentioned results support our conclusion about the role of complementary intralesional injection of steroids in improving the success rate of the optical urethrotomy procedure.

Hosseini J and colleagues reported a non-significant good success rate after installation of steroid ointment (as triamcinolone) in patients on a clean intermittent self-dilation regimen after optical urethrotomy, with the success rate raised to 90% after the second urethrotomy.[31] Ergün O et al. randomised ninety patients on triamcinolone ointment CIC and CIC alone with severe obstruction, and followed for 2 years, and reported significant improvements in Qmax and international prostate symptoms score (IPSS) were noticed at each period of follow-up duration ($p < 0.05$) with an overall recurrence rate of 29%, but this was not significant.[32] Gücük A et al. concluded that when combined with steroids, the efficacy of CIC in the short-term follow-up has risen dramatically after optical urethrotomy in the treatment of urethral stricture with a significantly lower recurrence rate and a non-significant relative improvement in Qmax.[33] Regmi S and colleagues also corroborate the above conclusions in that CIC with triamcinolone had decreased the recurrence rate significantly after the first urethrotomy and the very high fixation rate after the second optical urethrotomies in those who recur. In addition, there was an objective relationship between recurrence rate and stricture length, but the time to recurrence was relatively prolonged without being statistically significant.[34] These results in general also correlate with our work outcome about the supplemental use of triamcinolone ointment during CIC.

In two large meta-analysis studies with a systematic review done by[20] and[35], where they analysed several randomised trials about steroid usage, whether intralesional injection or intraurethral lubrication during CIC, they demonstrated that the application of local triamcinolone is found to decrease the rates of recurrence and time to recurrence significantly while Qmax has improved, but this was not statistically significant in the first study, whereas in the second study the time to recurrence was statistically highly significant. However, although the pure number of cases with recurrent stricture formation significantly reduced at different periods of the follow-up timeline, no objectively significant improvement was obtained between the rates of re-stricture, second visualised urethrotomy success rates, and complication rates between cases of local steroid applications and those who did not. Both of these review studies finally concluded that the use of topical steroids with optical urethrotomy obviously found to prolong the time to re-stricture and relatively reduces the high stricture recurrence rate following the first visualised endoscopic internal urethrotomy and makes it relatively easier to manage the recurrent strictures with a second urethrotomy, and finally, they recommended local steroids to be used with complementary intention, with encouraging outcomes for disease control.[20, 35]

Conclusions and Recommendations

Although both techniques of supplementary steroid use after optical urethrotomy show a good stricture stabilisation rate in comparison to urethrotomy alone, intralesional steroid injection was superior to steroid installation during CIC in reducing urethral stricture recurrence after one year of follow-up with low complications. I recommend its use as adjuvant treatment during urethrotomy; however, from a financial point of view, I still encourage the use of local steroid application during CIC by the patients with good acceptable results, negligible side effects and low cost.

Conflict of Interest Declaration

The author affirms that he is not connected to or involved with any organisation or entity that has a financial stake in the topics or resources covered in this paper.

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