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The Guide Wire: When Too Much of a Good Thing Is No Good at All

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ABSTRACT

The guide wire is a very useful medical device that helps make the cannulation of blood vessels or hollow structures safer. However, guide wires themselves can be a source of complication, such as with perforation and bleeding. Kinking of the guide wire is another complication that is less described. We postulate the sequence of events that precede kinking and discuss the ways to avoid them.

A 60-year-old man underwent optical urethrotomy for a bulbar urethral stricture. A guide wire was passed into an existing suprapubic catheter (SPC) track to facilitate the passage of a flexible cystoscope. This was performed to examine the proximal extent of the urethral stricture. At the end of the procedure, there was unexpected resistance when withdrawing the guide wire from the bladder. Cystoscopic examination via the SPC track eased the guide wire out eventually. It was found that a kink in the guide wire had prevented its smooth retrieval. The cause of this complication was likely due to looping of the guide wire within the bladder. The loop then resulted in the guide wire getting kinked. In order to prevent kinking, one must avoid looping. Looping occurs when an excessive length of guide wire is forced into a confined space. Therefore, it is important to stop advancing the guide wire when resistance is felt. Another method to avert this problem is to first estimate the length of guide wire that would pass into the space without it curling back. Then pass the guide wire only up to the point where it is deemed adequate. By practicing such precautions, the chances of running into a complication, such as guide wire kinking, can be reduced significantly.

INTRODUCTION

Guide wires are widely used in the field of surgery and medicine. They are commonly used in procedures that involve the cannulation of blood vessels or hollow structures. Their application has been expanded with the advent of the Seldinger technique [1]. However, guide wires are associated with complications such as perforation, bleeding, and knotting [1-4]. Kinking of the guide wire is another complication that is described very little. Our case illustrates the possibility of this problem. We postulate how kinking might arise and describe the steps to prevent this from happening.

CASE REPORT

A 60-year-old man underwent optical urethrotomy for a short bulbar urethral stricture. He developed this stricture following trauma from transurethral catheterization when he had coronary artery bypass graft surgery (CABG) 6 months prior to presentation. His urine had been drained through a suprapubic catheter (SPC) since the surgery. At the beginning of this surgery, a rigid cystoscope was passed into the urethra until the distal part of the stricture was seen. There appeared to be a pinhole-sized communication with the proximal urethra. However, there was difficulty in advancing a guide wire retrogradely into the bladder. The SPC was removed and a guide wire was passed into the track. The guide wire was used

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Figure 1. The appearance of the guide wire upon withdrawal from the bladder. The inset illustrates a magnified view of the kink..

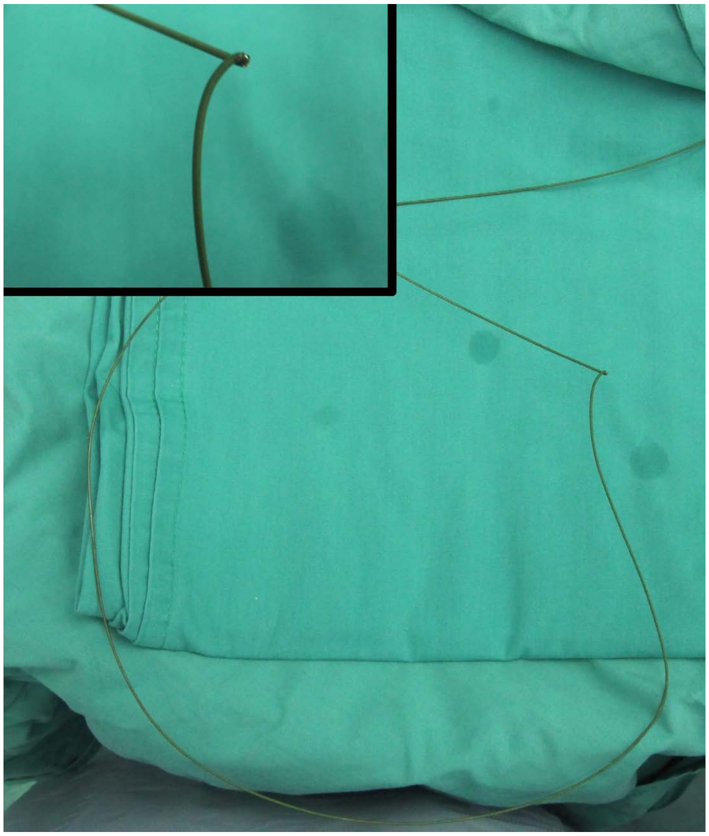

Figure 2. When an excessive length of guide wire forms a loop within the bladder, it produces a force in the opposite direction (black arrows) when it is being withdrawn (grey arrows).

to keep the track obvious while facilitating the introduction of a flexible cystoscope through it. The flexible cystoscope was guided to the point proximal to the stricture. A second surgeon then passed an optical urethrotome retrogradely and cut the stricture using the light from the proximal side as the guide. This rendezvous method successfully recanalized the urethra. A urinary catheter was passed into the bladder via the urethra.

The surgeon unexpectedly faced resistance when the guide wire was being withdrawn from the bladder via the SPC track. It was suspected that the guide wire had formed a knot within the bladder. After several unsuccessful attempts at extracting it, the flexible cystoscope was reintroduced through the SPC track to examine the cause of this complication. There was no knot seen in the wire but the passage of the flexible cystoscope within the track helped ease the guide wire out. It was then noted that the guide wire had kinked severely (Figure 1). The patient recovered uneventfully from the surgery.

DISCUSSION

Guide wires have become an integral part of many procedures in surgery and medicine. Its use spans over many specialties, and it is particularly useful in areas where the cannulation of a blood vessel or a hollow structure is involved. The popularity of guide wires probably stemmed from a very simple yet effective technique first described by Sven-Ivar Seldinger [1]. In the technique that now bears his name, a guide wire is passed through a needle that is first punctured into a particular vessel or hollow structure. Upon removal of the needle, the guide wire is used to facilitate the passage of a cannula into the structure by sliding the device over the guide wire. This technique makes cannulation much safer than "blind" insertion.

In urology, the guide wire is commonly used to help steer urological devices or endoscopes within confined spaces. Typical procedures where a guide wire is used in urology are ureteric stenting and ureterorenoscopy. Occasionally, a guide wire is used to maintain the patency of a SPC track in order to facilitate endoscopy via this route. This technique was employed in the management of our patient and it allowed an easy passage of the flexible cystoscope through the SPC track. However, the use of guide wires is not without complications.

Figure 3. The loop tightens within the bladder when the outward force (grey arrows) is countered by the inward force (black arrows).

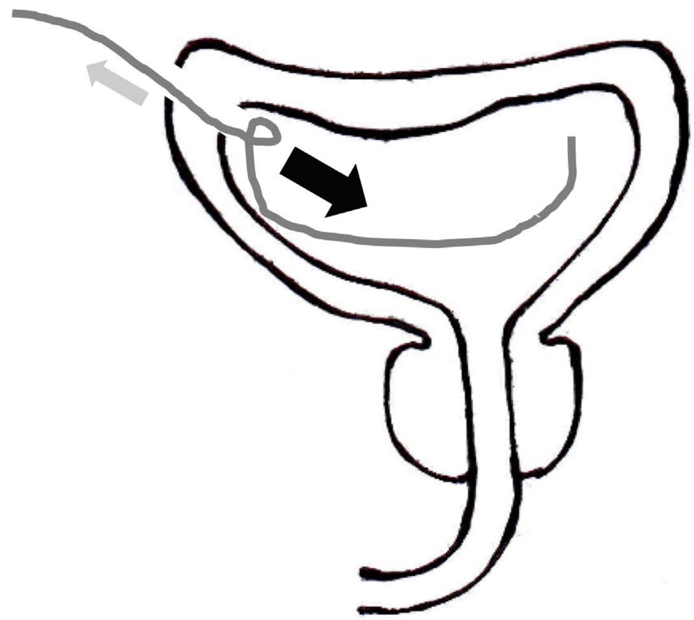

Figure 4. The loop eventually forms a kink within the bladder and prevents the guide wire from being withdrawn.

Perforation and bleeding are among the complications that can occur [1]. This is especially so if a stiff guide wire is used in a thin-walled structure such as a vein. Knotting, infection, fistulization, and retained guide wires have also been described [1-4]. Although kinking is not widely reported, it is certainly possible as illustrated by this case.

It is thought that looping must precede knotting [5]. We postulate that kinking has a similar origin because looping can also lead to kinking. Looping occurs when an excessive length of guide wire is forced into a confined space such as the bladder (Figure 2). The extra length of guide wire then forms a coil or loop within that space. When the guide wire is withdrawn, the weight and memory of the guide wire loop allows it to produce a force in the opposite direction (Figure 3). As the operator applies more force outwards, the loop tightens within and eventually forms a kink (Figure 4). In a situation where there is no looping, the guide wire can easily slide out of the space because the distal end of the wire does not produce any opposing force (Figure 5).

Kinking is an avoidable complication. In order to prevent kinking, one must avoid looping. Extra care has to be taken to ensure that no excessive length of the guide wire is inserted. Often, slight resistance can be felt once the excess guide

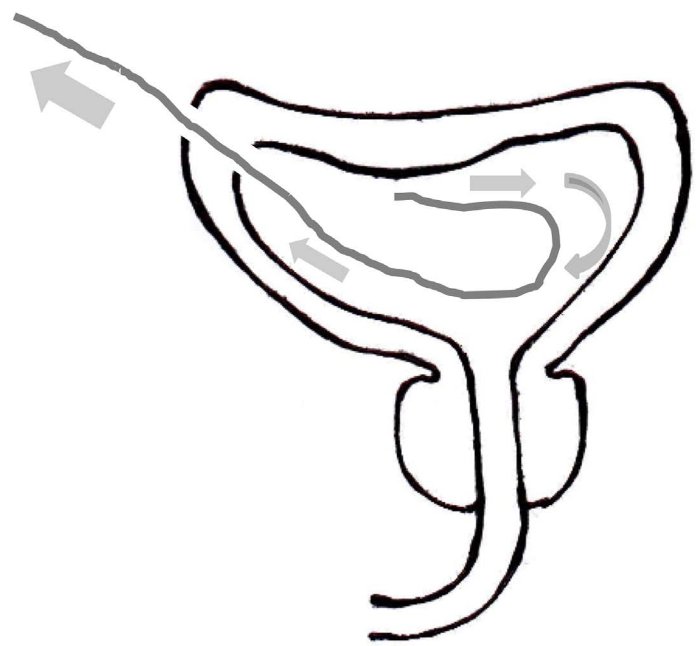

Figure 5. When there is no looping, the guide wire slides out easily because there is no opposing force that would cause it to kink.

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wire starts to form a loop within. The surgeon should avoid advancing the guide wire any further at this point. However, sometimes the guide wire can coil without much resistance until it has formed several loops. One way to circumvent this problem is to first estimate the length of guide wire that should safely enter the space without looping. If an adequate length is deemed to have passed, it is wise to stop advancing the guide wire further. This is one situation where too much of a good thing may not be good at all.

The guide wire has become an indispensable tool in the arsenal of devices used in modern surgery and medicine. It has made interventional procedures such as cannulation, stenting, and endoscopy much safer. Nevertheless, the design of the guide wire continues to evolve to improve its performance. Research is aimed at making it more resistant to structural failure and therefore less prone to complications [6,7]. Despite our quest for the perfect guide wire, we should still bear in mind that it is the manner in which we use it that really matters. Good knowledge of the guide wire's property and behavior is the key to minimizing complications. When it is handled with great care and skill, the guide wire is one of the most useful medical devices of our time.

CONCLUSION

When using the guide wire, it is crucial to be aware of the possible complications that might arise. Kinking of the guide wire is one such complication. It is, however, an avoidable complication because looping is postulated to precede kinking. In order to prevent looping, the operator must not forcefully advance the guide wire once resistance is felt. It is also good practice to estimate the length of guide wire that can enter the space without forming a loop. These steps can help avert looping and thus reduce the possibility of kinking.

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