3 Basics of Destandau's Technique

Introduction

Dr Jean Destandau, MD, neurosurgeon from Bordeaux, France, developed a technique of endoscopic spine surgery in 1993 (**Fig. 3.1**).[1,2,3] This technique is based on the basic principle of laparoscopic technique of triangulation between an endoscope and suction with working instrument. This is the same principle of triangulation used in arthroscopy by orthopedic surgeons. However, the basic difference between laparoscopic, arthroscopic, and Endospine triangulation is that, in the Endospine–Destandau technique, the angle between the endoscope and the working instrument remains constant. In laparoscopy, another surgeon assists by providing visualization, while the laparoscopic surgeon adjusts the angle between the endoscope and the two working instruments (**Fig. 3.2**). In arthroscopy, the surgeon holds the endoscope in one hand and the working instrument in the other, ensuring that the instrument always remains in front of the tip of the endoscope. By incorporating a fixed angle between the endoscope and the working instrument, these issues are resolved automatically.

Basics of the Technique

In Destandau's Technique the surgeon uses Endospine, a set of outer tube/insert and inner tube/working insert with an endoscope. The endoscope used with Endospine is 18-cm-long, rigid, straight, 0-degree endoscope. It is an universal endoscope used in cystoscopy, arthroscopy, and sinoscopy, etc. The outer tube is elliptical in shape rather than circular. Endospine was initially used for lumbar disc herniation. The target area in the lumbar region is elliptical, in between two laminae, medially the spinous process and laterally the medial facet. Hence the outer tube is elliptical (**Fig. 3.3**).



Fig. 3.1 This is the first version of Endospine used by Dr Jean Destandau in 1993, a custom-made version. There are outer and inner tubes with trocar. The inner tube endoscope channel was prepared such that it could house any endoscope. The fixation screw for outer and inner tubes was used to fix the nerve root retractor also.

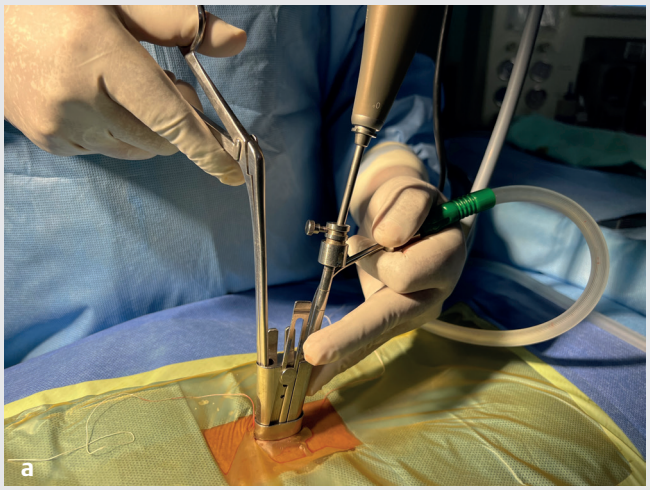


Fig. 3.2 **(a)** Endospine prototype used for endoscopic lumbar discectomy with a 3D endoscope.



Fig. 3.2 **(b)** Endospine prototype used for endoscopic lumbar discectomy with the Tipcam 3D.

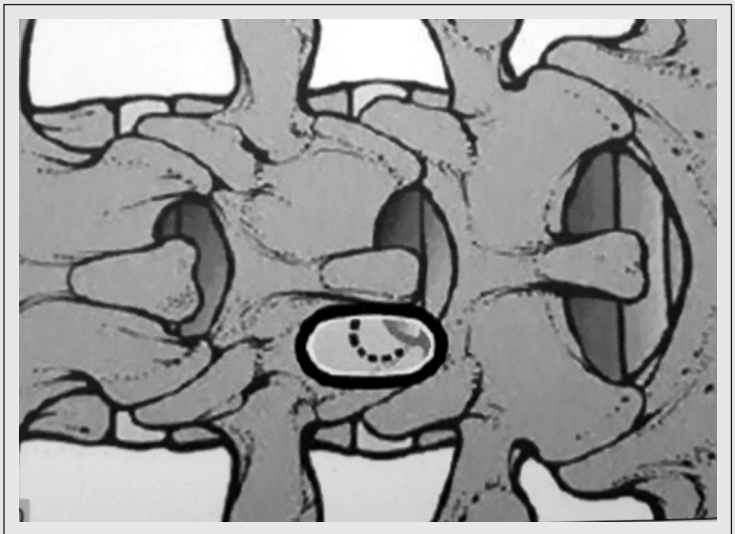


Fig. 3.3 Elliptical interlaminar space.

The inner tube/working insert fits into the outer tube with a tightening screw or a rachet-type lock (**Fig. 3.4**). There is an inherent telescoping movement in between these tubes.

The working insert has four in-built channels inside (**Fig. 3.5**).

The channels for endoscope and suction are at an angle of 12 degrees to the wide channel for instrument. Because of this angle, we can use 0-degree endoscope as an angled endoscope. This helps in minimizing the fogging of endoscope tip. When the endoscope and the instrument work parallel to each other, there is intermingling of the instruments.[4] In addition, the surgeon has to use an angled endoscope when endoscope and instrument work parallel to each other. The fourth channel is for nerve root retractor, used to retract the nerve root medially to expose disc space. The outer and inner tubes are fixed such that there is an artificial space created in between these two tubes. This is the working space for the instruments. Once the excision of the bone is achieved, the inner tube can be pushed inside/down. If there is no space maintained in between the outer and inner tubes, the endoscope will touch the tissue in front and it will hamper the vision. Also, there will be splashing of fluid over the endoscope lens if adequate space is not maintained in between these tubes. The suction is used with the left hand and working instrument is in the right hand. With suction in the left hand, the surgeon can move the whole

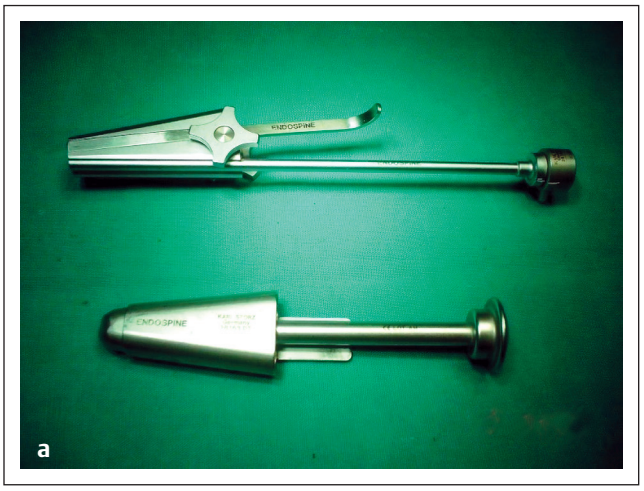


Fig. 3.4 Endospine. **(a)** Outer tube and inner tune of Endospine.

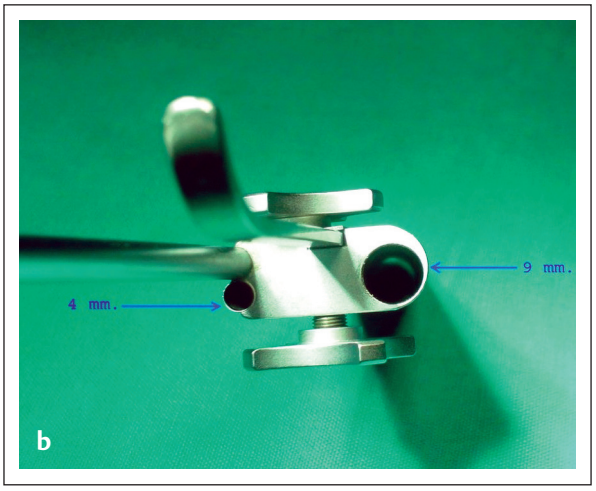


Fig. 3.4 Endospine. **(b)** Inner tube with various ports.



Fig. 3.5 On the left side of the working insert, it has two channels of 4 mm diameter, which are parallel to each other. The medial 4-mm channel hosts the endoscope and then the endoscope remains fixed with lock. The second 4-mm channel is for suction tube. The largest channel of 8 mm is for working instrument.

system in medial, lateral, cranial, and caudal direction. The same movements are possible with instrument in the right hand. The suction in the left hand and instrument in the right hand work as two breaks for the system to maintain its stability. When the surgeon uses suction to clean the operative area, the instrument in the right hand keeps the system stable, and vice versa when the surgeon uses instrument, suction in the left hand keeps the system stable (**Fig. 3.6**). This synchronization of movements of both hands is necessary while looking at the image on the screen. Surgeon should learn this synchronization of both hand movements, along with usage of both hands while looking at the screen image. This is the basic principle of the Destandau's Technique of minimally invasive spine surgery.

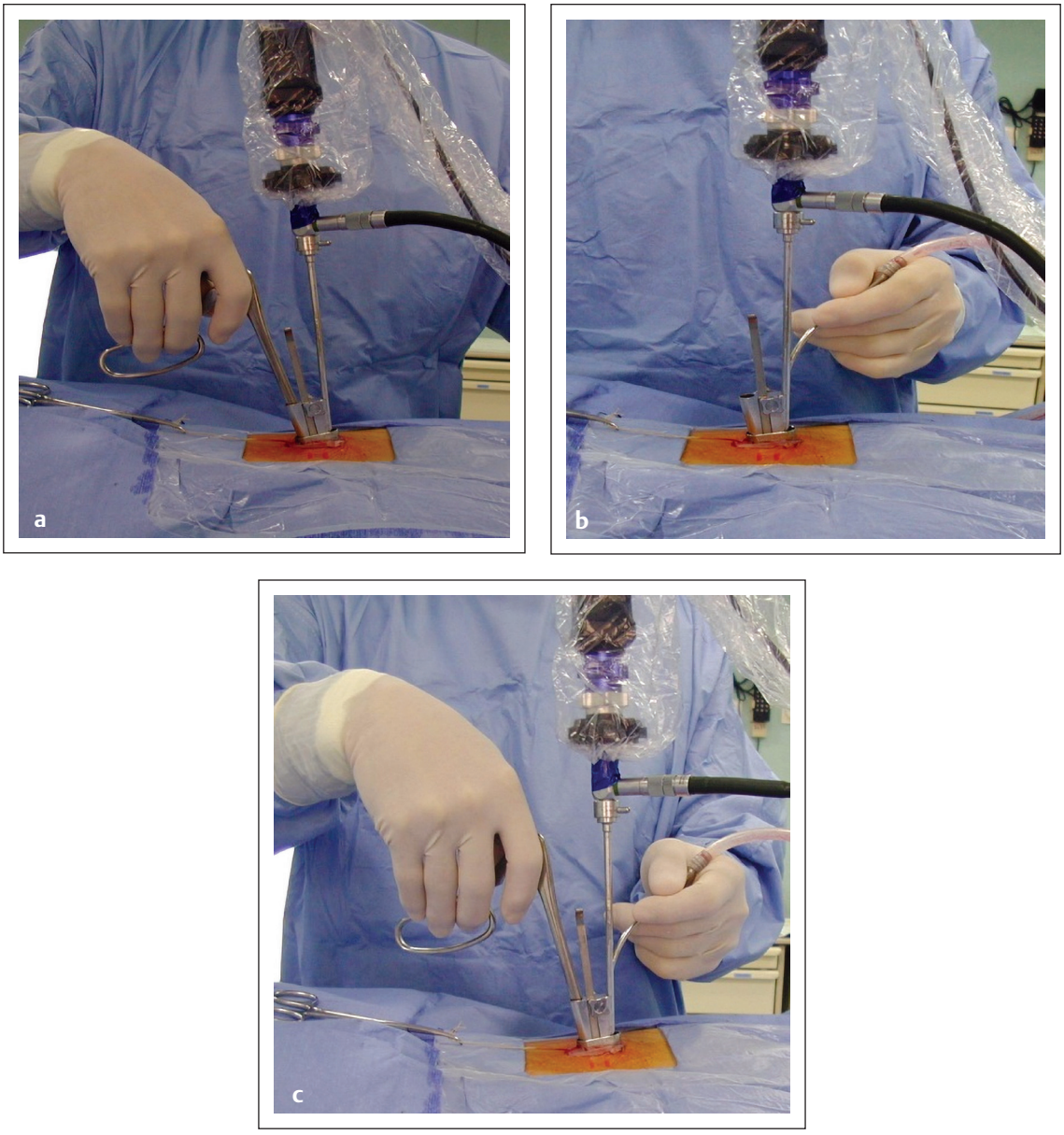


Fig. 3.6 **(a)** Right-hand movement of Endospine. **(b)** Left-hand movement of Endospine. **(c)** Stable Endospine.

Once the outer tube is pushed in between the muscles laterally and the spinous process medially, and if the muscles are not separated off the midline carefully, then muscles will intrude inside the outer tube. The surgeon uses two gauze pieces to retract the muscles laterally. The cranial gauze piece is pushed over the cranial lamina and the caudal gauze piece is pushed over the caudal lamina.

The gauze pieces must be attached with a thread so that one will not forget the gauze piece by mistake. Usually this can happen in multilevel lumbar region surgery (**Fig. 3.7**). One can use a metal retractor lateral to the outer tube to retract the muscles (**Fig. 3.8**). This retractor is very useful especially in very obese patients to retract the muscles at depth (**Fig. 3.9** and **Fig. 3.10**).

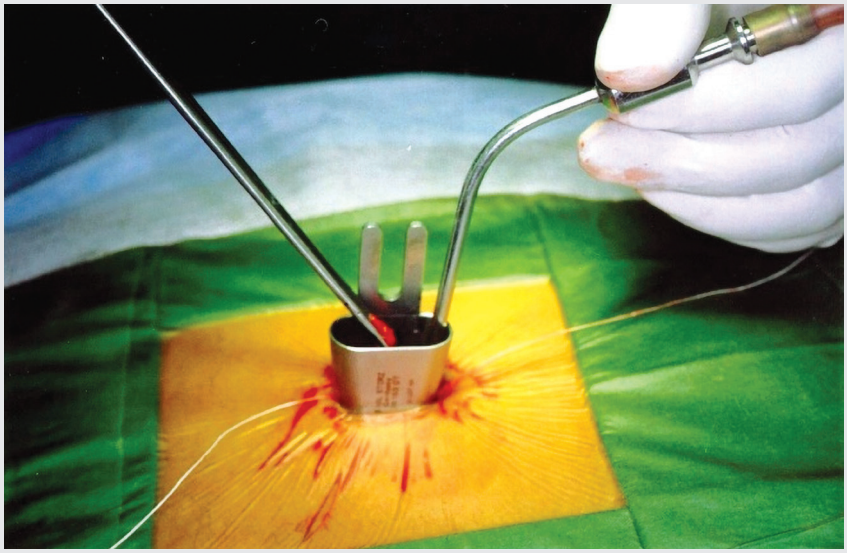


Fig. 3.7 Two gauze pieces with thread.

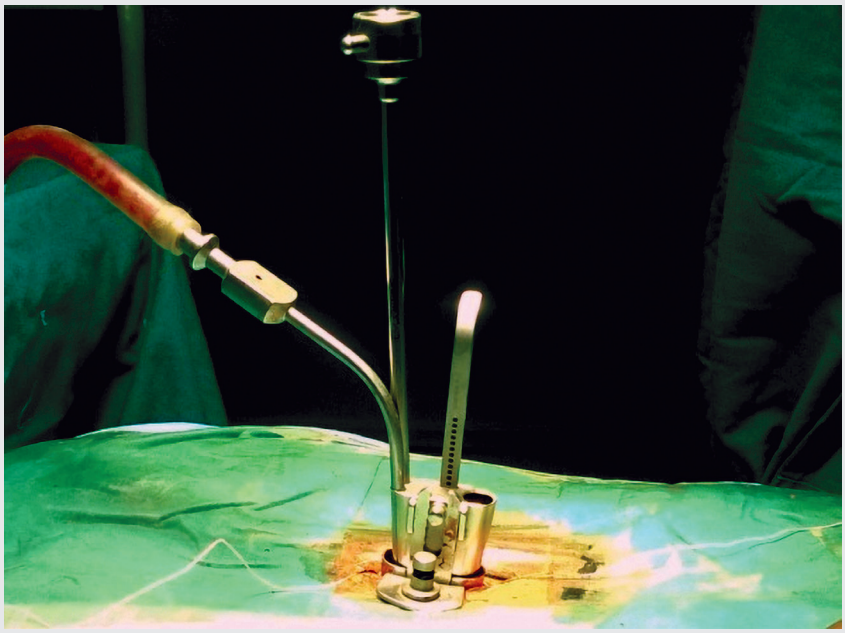


Fig. 3.8 Metal retractor to retract muscles.

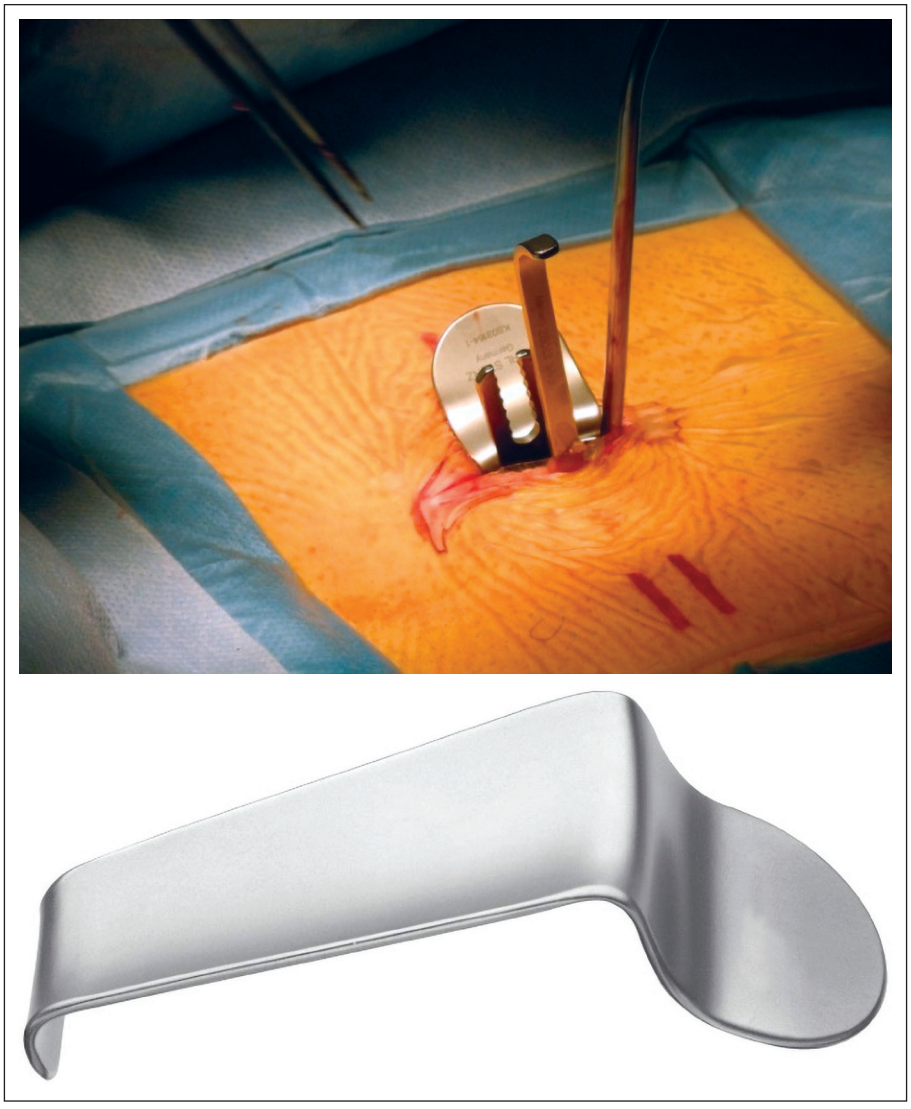


Fig. 3.9 Image of Karl Storz retractor.

Endospine Duo System

The Endospine Duo system **(Fig. 3.11, Fig. 3.12, Fig. 3.13**, and **Fig. 3.14)** has been developed to reduce the size—length of incision. The indications are identical to those of the standard Endospine system. Smaller incision, along with relatively low weight of Endospine Duo system with a heavy HD camera head, is responsible for increased need for extra efforts of the surgeon to keep Endospine Duo stable while in use. Hence the surgeon needs extra efforts to guide the system during use. Thus Endospine Duo system should be used mainly for cosmetic reasons, especially in young women and children.

The Duo system has a diameter of 23.5 mm as compared with 29 mm of the standard Endospine system. Use of Endospine Duo system allows the incision to be reduced by 5.5 mm **(Table 3.1)**.

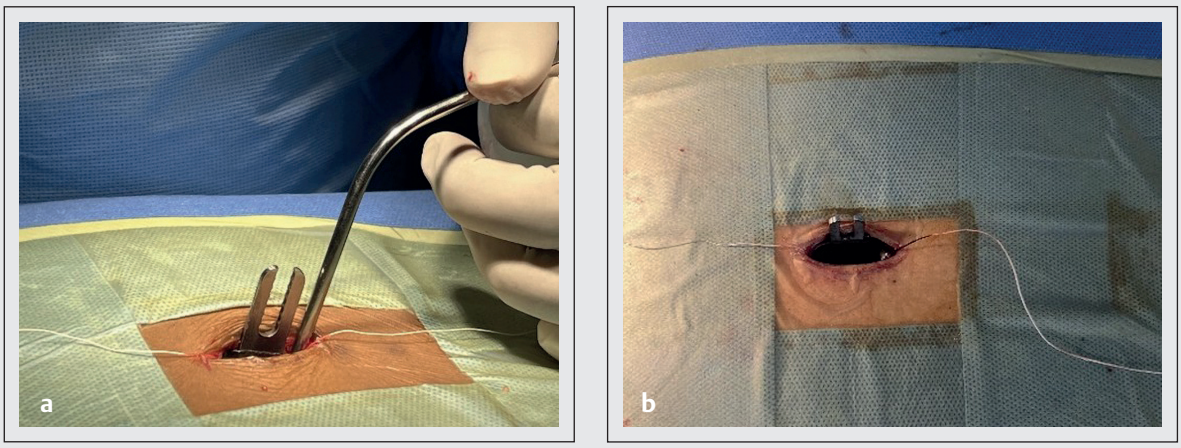


Fig. 3.10 **(a, b)** The entire outer tube is inserted within the skin plane in an obese patient.



Fig. 3.11 Endospine system.



Fig. 3.12 Endospine duo system for smaller incision.

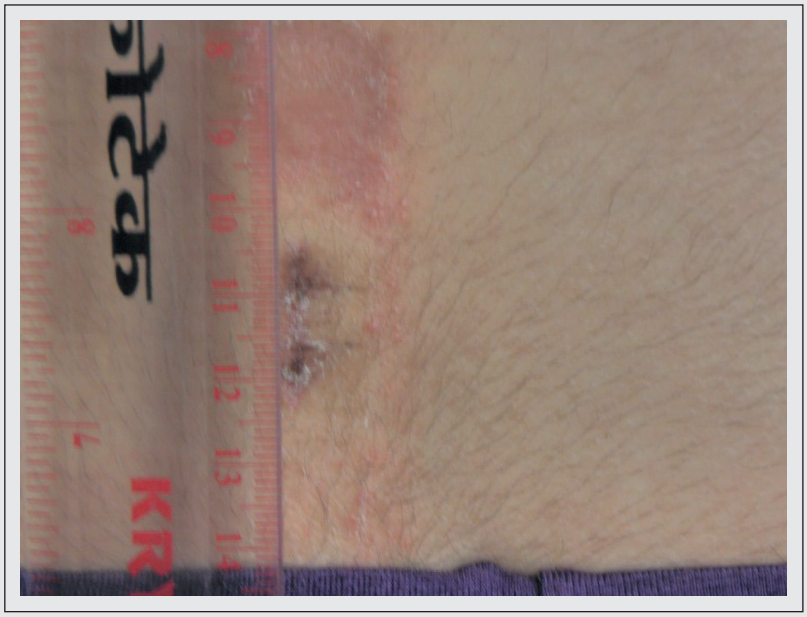


Fig. 3.13 The 15-mm incision with Endospine Duo system. Tubular retractor in minimalism in spine surgery.

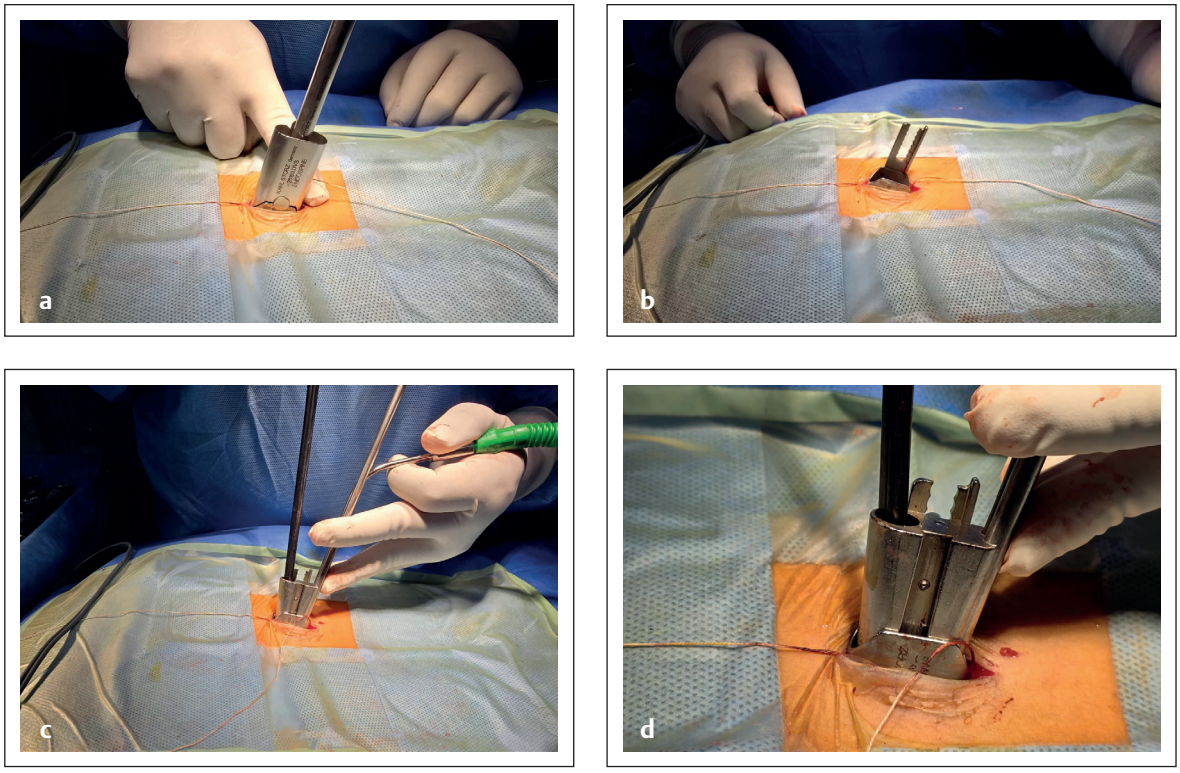


Fig. 3.14 **(a–d)** Endospine DUO.

Table 3.1 • **Comparison between standard Endospine system and Duo Endospine system.**

	Endospine	Endospine Duo	Endospine	Endospine Duo	Endospine	Endospine Duo
	Operating tube (mm)	Operating tube (mm)	Obturator (mm)	Obturator (mm)	Working insert (mm)	Working insert (mm)
Total length	65	48.5	134	134	43.9	60
Width proximal	23.5	29	21.8	23	23	26.6
Width distal	17.4	17				
Working channel					9	8
Diameter						
Suction channel diameter					4–4.6	4–4.6
Nerve retractor profile					Shallow tall	Straight
Nerve retractor length					112	112

In the learning stage initially, a surgeon should try to avoid using Endospine Duo system.

Specialized tubular retractor systems are usually used to obtain working space between the skin and the spine, which allows direct visualization of spinal pathology. Now obviously working through a tubular corridor requires longer instruments, which are bayoneted to allow the surgeon to keep his/her hand away from visualization corridor.

Contrary to Endospine, outer tube of which is mobile tubular retractor, the other tubular retractors are generally attached to a table-mounted retractor holder. This allows for maintaining position and angulation of tubular retractor.

Many surgeons, especially neurosurgeons, prefer to use microscope to visualize the spinal anatomy through the tubular retractor.

"Wanding maneuver" allows the surgeon to reach different areas of spine. Wanding is performed by loosening the table-mounted retractor holder and placing the largest dilator through the tube, which acts as a handle for manipulation of tubular retractor. Wanding maneuver helps in angulation underneath the skin to reach various areas of the spine, especially contralateral side and adjacent spinal level.

Endospine has outer and inner tubes working insert, outer tube retracts the muscle laterally and the space in between outer and inner tubes is used as working space. If the muscle separation from the lamina and interspinous ligament is carefully done, there are fewer chances that muscle will intrude into the visual field. On the contrary, fixed tubular retractor has to be docked over the bone so that muscle does not intrude inside. While using Endospine Destandau's Technique, the outer tube slides sideways over the laterally retracted muscle.

Movements of instruments within the tubular retractor are dictated geometrically by the diameter and length of the tubular retractor. For this reason shortest tubular retractor that will reach from the skin to lamina is used. Shorter tubular retractor is avoided as it will allow retracted muscle to creep into operative field and disturb the surgeon's endoscopic vision.

Within the tubular retractor, the surgeon has to maneuver instruments with both the hands with an angle (A). This angle changes with the width of the tubular retractor and also the length of tubular retractor. Hence in obese patients for whom the surgeon has to use longer tubular retractor of same width, the angle between two instruments becomes acute. This acute angle creates difficulty in maneuverability of instruments. Hence there is tendency to use wide and long tubular retractor in such cases. On the contrary, when Endospine outer tube with inner tube is used, this angle between two instruments, that is, suction tube with endoscope and working instrument, always remains constant. This angle between suction tube and working instrument is around 12 degrees, which is the same angle when the surgeon uses two instruments with two hands for regular dissection. In Endospine this angle between two instruments, which is 12 degrees, is at the tip of working insert. There is inherent telescoping movement in between the outer tube and working insert, which helps the surgeon move instruments, whole Endospine, with endoscope, outer tube, and working insert, in any direction with the same 12-degree angle. Therefore in Endospine, there is only one outer tube, and there is no need of multiple-size tubes such as X tubes **(Fig. 3.15)**.

Fig. 3.16 illustrates the principle that a shorter or wider tube allows the surgeon to maneuver instruments during the operation in better way. As the length of the tube increases or the width (S) of tube decreases, the angle (A) that the surgeon may use to operate within the tube decreases.

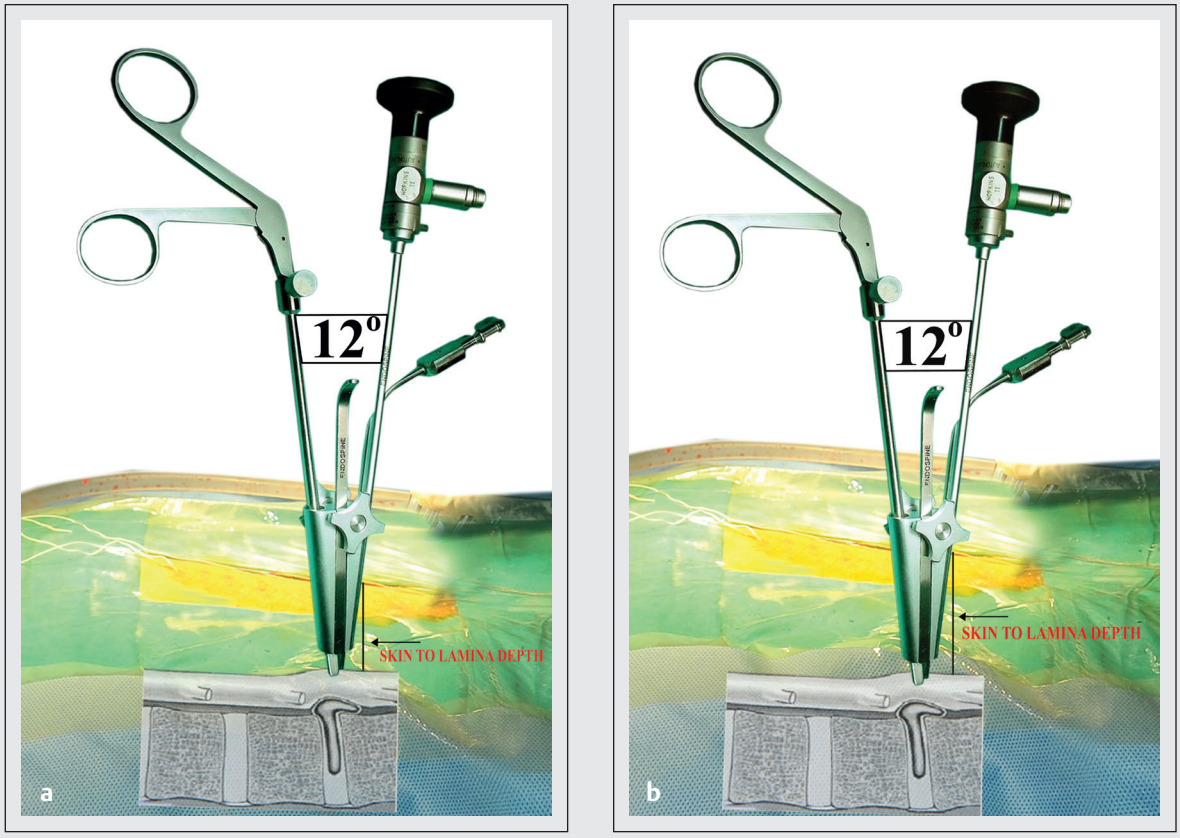


Fig. 3.15 **(a)** Endospine in the thin built patient. Angle remains 12 degrees even if half part of Endospine remains above skin. **(b)** Endospine in the obese patient. Angle remains the same even if whole of Endospine is buried beneath skin to reach lamina disc.

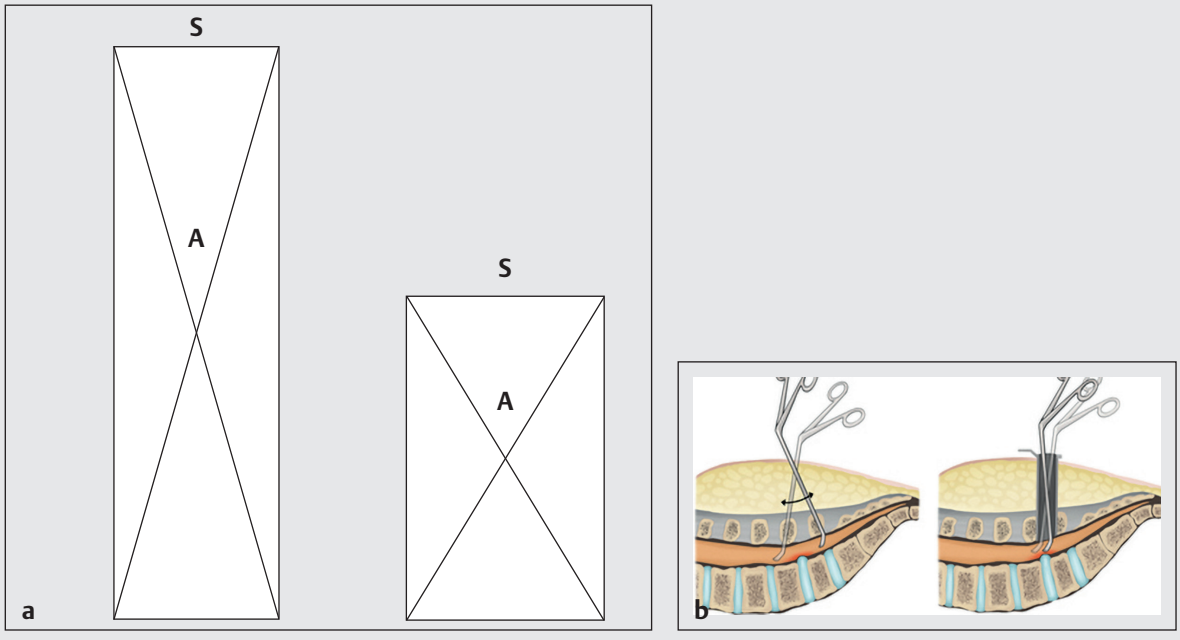


Fig. 3.16 **(a)** Illustrates the principle that a shorter or wider tube allows the surgeon to maneuver instruments during the operation in better way. **(b)** In a fixed tubular retractor, the movement of instruments is limited because the tubular retractor is fixed.

References

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