

Taylor's Approach is The Best Approach to Overcome Difficulty In Lumbar Puncture in Difficult Spinal Cases

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Abstract: Subarachnoid block is the safe anaesthetic technique for lower abdominal, perineum and lower limb surgeries, but patients with spinal deformities represent technical difficulty for its establishment. In these situations general anaesthesia is the only option but it may be associated with complications in patients with difficult airway. This study is aimed to find out whether Taylor's approach is beneficial to patients who have difficulty in spinal anaesthesia. 50 patients of ASA I and II of age between 30-70 years of either sex who have different spinal abnormalities and degenerative diseases of spine and have difficulty in establishing lumbar puncture with standard technique at L₃₋₄ and L₄₋₅ spaces by using both midline and paramedian approaches were enrolled for this clinical study. We established subarachnoid block by using Taylor's approach and completed the surgeries and observed total number of attempts, time taken for lumbar puncture and block success was defined according to clinical efficacy. We found that results of the study are encouraging. Success rate was 94% and average number of attempts are also less.

Keywords: Ankylosing spondylitis, Arthritis, Difficult spinal, skeletal fluorosis, Taylor's approach.

I. Introduction

Central neuraxial anaesthesia greatly expands the anaesthesiologists armamentarium providing the alternative to general anaesthesia. Central neuraxial anaesthesia by blunting the neuro endocrine stress response, reduces the incidence of major perioperative complications including deep vein thrombosis, pulmonary embolism, blood loss, respiratory complications, perioperative arrhythmias and ischemia. Subarachnoid anaesthetic techniques have proved to be extremely safe and require a small volume of drug, virtually devoid of systemic pharmacologic effects, to produce profound, reproducible sensory anaesthesia and motor blockade. Even epidural anaesthesia necessitates the use of large mass of local anaesthetic drug that produce pharmacologically active systemic blood levels, which may be associated with side effects and complications unknown with spinal anaesthesia [1-3]. But all the times standard technique of subarachnoid block at L₃₋₄ or L₄₋₅ is not successful and it leads to unnecessary exposure to endotracheal intubation and general anaesthesia in below umbilical surgeries. Hence this necessitates the anaesthesiologists for acquisition of the skill in all the techniques available like Taylor's approach and ultra sound guided subarachnoid blocks.

Patients with deformed spine due to scoliosis, kypho-scoliosis, or arthritis (osteo arthritis, rheumatoid arthritis and ankylosing spondylitis) are challenging for anaesthesiologist due to technical difficulty for establishing the successful subarachnoid block because of rotation of spine, limited articular mobility, obliteration of the interspinous spaces, and impossibility to position the patient adequately. In many patients accurately determining the optimal puncture site is impossible. The abnormal interspace shows asymmetry of bony structures, with asymmetric articular process. Abnormality can be present in patients for reasons other than obesity and scoliosis. The paramedian technique may be selected in patients who cannot be positioned easily due to skeletal deformity and a modification of paramedian technique by Taylor's approach has provided a reliable and less traumatic alternative in deformed and difficult spinal cases for establishing the subarachnoid block [4-6].

This study is aimed to know how far Taylor's approach is successful in difficult spinal cases and to determine number of attempts for successful block and time taken for lumbar puncture.

II. Materials And Methods

After approval of the institutional ethical committee and informed and written consents from patients this clinical study was conducted in the department of anaesthesiology, Rajiv Gandhi Institute of Medical Sciences, Ongole, Prakasam District, Andhra Pradesh.

Difficult spinal is defined in this study as two experienced anaesthesiologists with experience of 5-10 years failed to perform lumbar puncture at L₃₋₄ and L₄₋₅ spaces by using both midline and paramedian approaches even after 10 minutes of the first skin puncture.

50 patients of ASA I and II of age between 30-70 years of either sex who have difficulty in establishing lumbar puncture with standard technique at L₃₋₄ and L₄₋₅ spaces by using midline and paramedian

approaches with different spinal abnormalities and degenerative diseases posted for below umbilical surgeries under spinal anaesthesia were included in this study. All these cases were failed cases with standard technique due to difficult spine. Patients who were receiving medicines for cardio vascular diseases, oral anticoagulants, anti platelet drugs and patients having hyper sensitivity to local anaesthetics, or having contra indication to regional anaesthesia were excluded from this study. All patients were preoperatively evaluated clinically, with routine investigations. The radio graphs of the spine were reviewed before attempting the subarachnoid block by median, paramedian and Taylor's approach.

Taylor's approach is a variation of the paramedian approach, described by Taylor was carried out at the L5-S1 interspace, the largest interlaminar interspace of the vertebral column. A spinal needle is inserted in a cephalo-medial direction through a skin wheel raised 1cm medial and 1cm caudal to the lowermost prominence of the posterior iliac spine. The posterior iliac spine may be located immediately anterior to the "skin dimples" often found overlying the superior aspect of sacrum [Figure 1, 2, 3]. If bone is encountered on initial needle insertion, the needle is walked off the sacrum to enter the subarachnoid space. After cerebrospinal fluid is obtained, the subarachnoid block is carried out.

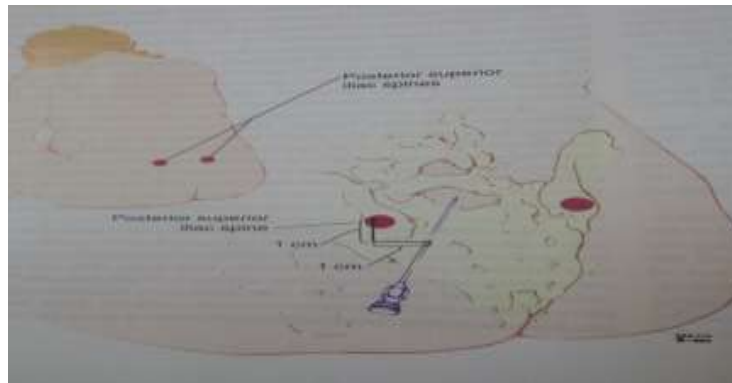


Figure1. Showing landmarks of the Taylor's approach



Figure2. Showing skin dimples



Figure3. Showing Taylor's approach for the subarachnoid block

After arrival in the operation theatre standard monitoring including heart rate, continuous electro cardiogram, pulseoxymetry, and non invasive measurement of blood pressure, cycled at 3 minutes intervals were done. All the patients were preloaded with Ringer lactate 10 ml per kg as there is a chance of high levels of

spinal blockade due to deformed spines and short stature. The lumbar puncture was performed with 23-26 gauge quincke spinal needles in sitting position under all strict aseptic precautions after local anaesthetic infiltration at L₅-S₁ space by using Taylor's approach. After identification of needle placement by free flow of cerebro spinal fluid, the subarachnoid block was established by administration of 3-4 ml of 0.5% bupivacaine hyperbaric solution and patient is turned to the supine position and titrated the level of block by tilting the table according to the surgical needs. We observed number of attempts for lumbar puncture and time for successful subarachnoid block. Procedure time is measured from first skin puncture to appearance of cerebro spinal fluid at spinal needle hub. New skin puncture is considered as another attempt. However redirection of the needle without a skin puncture cannot be considered as additional attempt.

All the blocks were performed by the anaesthesiologists who were experienced and well versed with Taylor's approach to avoid discomfort to the patients, as all the patients had discomfort due to previous attempts. The block success was defined as the correct identification of subarachnoid space followed by free flow of cerebro spinal fluid and completion of the surgery without any further supplementation of analgesia. Other outcome measures such as onset, intensity or extent of the block were not recorded. All the patients were observed and followed for 7-14 days of their postoperative stay in the ward for any complications as the spine is manipulated repeatedly. All the patients were further instructed to contact by phone or come for review, if they face any problems. Simple statistical methods like distribution, mean and standard deviation were used for analysis of the data .

III. Results

47 cases out of 50 cases labeled as difficult spinal cases posted for lower abdominal and lower limb surgeries were successfully established block by using Taylor's approach. 3 cases were labeled as failed. Out of 3 cases, 1 case was of varicose veins left the hospital against medical advice after second time failure of the subarachnoid puncture. In 1 case block was partial and is completed by supplementation with extra analgesia and remaining 1 case is completed by general anaesthesia as we failed to establish the subarachnoid block. Success rate was 94% and failure rate was 6%. Mean duration of lumbar puncture was 5.5±0.51 and mean number of attempts per successful block was 1.5±0.54. We made total 65 attempts for 47 successful blocks with success rate of 94%. The results of using Taylor's approach to overcome difficulty in establishing subarachnoid block is encouraging.

Distribution of the patients according to the age and sex			
Age	Male	Female	Total
30-40	2	1	3
41-50	7	0	7
51-60	10	1	11
61-70	27	2	29
Total	46	4	50

Distribution of the patients according to the spinal abnormality	
Spinal abnormality	Total number of cases
Short stature	4
Rheumatoid arthritis	5
Ankylosing spondylitis	8
Kypho scoliosis	8
Skeletal fluorosis	25
Total	50

Distributions of successful cases according to number of attempts and percentage of successful blocks			
Attempts	Number of cases	Total number of attempts	Percentage
Single attempt	31	31	65.96%
Second attempt	14	28	29.78%
Third attempt	2	6	4.26%
Total	47	65	100%

IV. Discussion

The spinal anaesthesia can be used to provide surgical anaesthesia for all procedures carried out on the lower half of the body, lower limbs, pelvis, genitals and perineum. The concept of spinal anaesthesia is simple enough but the pertinent anatomy must be in mind while inserting the spinal needle for establishing the subarachnoid block [1-3]. Patients with deformed spine due to scoliosis, kypho scoliosos, short stature or arthritis (osteo arthritis, rheumatoid arthritis and ankylosing spondylitis) and other degenerative diseases like

soft tissue calcifications and fluorosis and other diseases represent specific challenges to the anaesthesiologist due to anatomic and technical difficulty for successful subarachnoid block [4-6]. Kyphoscoliosis is characterized by anterior flexion and lateral rotation of vertebral column. Spinal curvature of more than 40° is considered severe and is likely to be associated with the physiological de-arrangements in the cardiac and pulmonary function. Regional anaesthesia is difficult in these patients with an increased incidence of complications and failure to obtain satisfactory analgesia [7]. Achondroplasia is the most common form of dwarfism (short stature) which results from abnormal cartilage formation at epiphyseal growth plates. In these cases crowding of intervertebral spaces, more so in the lower thoracic and lumbar regions leads to difficult spinal [8]. Ankylosing spondylitis is a chronic inflammatory disease of the joints and is characterized by fusion of the bones in the spine which causes loss of flexibility of the back and neck which leads to difficult airway management and difficult spinal. In these cases trend has been to deal with the airway challenge and avoid neuraxial analgesia [9]

In our study out of 50 cases, 25 cases were from endemic fluorosis area in the Prakasam district, Andhra Pradesh, India. Fluorosis is a disease where excessive deposition of calcium occurs in bone and soft tissues. It results from excessive ingestion of fluoride in the drinking water. The fluoride content of normal drinking water is less than 1 ppm. In India, parts of south east asia, large areas have been reported with high water fluoride content. Fluorosis is an endemic disease and public health problem. Skeletal fluorosis is characterized by pain in the back, joints may be associated with stiffness of spine and parasthesia in the limbs. Calcification of ligaments and soft tissue in the spine may occur. Dental fluorosis is the early sign of fluorosis [10]. X-ray films of forearm and the spine in fluorosis cases shown calcification of the interosseous membrane in forearm and increased density of the spine and longitudinal ligaments, osteophyte formation, narrow intervertebral spaces respectively. We observed difficulty in fluorosis cases. In these cases, after passing spinal needle through skin and subcutaneous tissues we felt bony resistance throughout the interspinal spaces in both midline and paramedian approaches. General anaesthesia can also be difficult in view of associated cervical spine problem.

The anatomic midline approach is the technique of the first choice because it is often easier to appreciate and requires anatomical projection in only two planes-sagittal and horizontal and provides a relatively avascular plane. When difficulty in needle insertion is encountered due to scar tissue arthritic changes or scoliosis one option is to use the paramedian route. It does not require the same level of patient cooperation and reversal of lumbar lordosis for success of lumbar puncture. The paramedian approach requires an additional oblique plane to be considered [11]. A variation of the paramedian approach is the lumbosacral approach described by Taylor. This technique is carried out at L₅-S₁ inter-space by inserting the spinal needle in a cephalo medial direction, 1 cm medial and 1 cm caudal to the lower most prominence of the posterior iliac spine. This technique is described in all the standard textbooks which is usually used in surgeries in Jack-Knife position and it is alternative technique when standard technique at L₃₋₄ and L₄₋₅ spaces fails. This is a very useful method in case of spinal fusion, arthritic joints, opisthotones, skin infection in the lumbar region or in other conditions in which the usual approach is difficult or impossible [12-14].

Subarachnoid block at L₅-S₁ inter-laminar space offers distinct advantage. It is lowest and widest available lumbar space, chances to trauma to spinal cord are negligible. this space is least affected by arthritic and degenerative changes, hence Taylor's approach is the better alternative to midline approach to overcome difficult spinal cases for establishing the subarachnoid block with adequate sensory and motor blockade for the surgical procedures below umbilicus and lower limbs. Acquisition of knowledge and skill pertinent to the use of Taylor's approach for establishing subarachnoid block is an important part of learning. The teaching of procedure facilitates learning and increase safety. Learning and practice of Taylor's approach in predicted difficult spinal cases shortens the duration of procedure and increases the comfort due to reduced number of attempts and subsequent trauma.

In previous study they have reported 92% success rate by training residents in deformed spines in a clinical teaching study and acceptable failure rate by 15% [15]. Jindal et al successfully used Taylor's approach to establish the spinal anaesthesia in ankylosing spondylitis patients posted for percutaneous nephrolithotomy [9]. Patil AD et al used Taylor's approach successfully in case of short stature asthmatic patient and avoided general anaesthesia in a case of rectal prolapsed surgery [8]. We have reported 94% success rate and very less failure rate of 6% by using Taylor's approach in establishing subarachnoid block in difficult spinal cases.

In this study we did not encountered any complications even though spine was manipulated repeatedly.

V. Conclusion

Taylor's approach is the best, reliable and less traumatic approach when standard technique at L₃₋₄ or L₄₋₅ fails for establishing subarachnoid block in difficult spinal cases. Learning and practice of Taylor's approach in predicted difficult spinal cases shortens the duration of procedure time and increases the comfort due to reduced number of attempts and subsequent trauma.

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