

Management of Thoracic Spine Tumors

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Abstract: In our study on thoracic spine tumors on 30 cases 17 cases were (56.67%) females while males were 13 cases (43.33%). Cases ages range from 1.5y: 75y, majority of cases were of old age with mean age 46.317y. The most common presenting symptom was back pain (46.67%), followed by weakness (26.67%), (13.33%) of cases are presented by radiculopathy. At time of assesment (83.33%) of cases have back pain, (70.00%) have weakness, (66.67%) have sensory deficit, (43.33%) have sphencteric disturbance & (20%) have radiculopathy. Correlation between clinical picture & clinical progress days post operative, 6months, 1year shows that the patient dont having neurological deficits shows better clinical progress at short & long terms. In (53.33%) of our cases the tumor was extradural, (50%) of them are metastatic in (36.67%) it was intradural extramedullary mostly Meningioma & nerve sheath tumors. (10%) intramedullary, (66.67%) of them were Epindymoma, (33.33%) were Glioblastoma. In our study most cases are managed surgically while (13.33%) are managed conservatively. (57.69%) of our cases operated for tumor excision, (19.23%) have decompression, (11.54%) have decompression & posterior fixation, (3.85%) have anterior fixation & (7.69%) have both anterior & posterior fixation. most surgically managed cases are operated by posterior approach, (3.85%) are operated laterally, (3.85%) are operated anteriorly & (7.69%) operated by combined posterior & lateral approach. (13.33%) of our cases have received radiotherapy (50%) of them received it post operative & (50%) have it as 1ry treatment, only (3.33%) of cases have received chemotherapy. Primary source of metastases was the lung, breast, prostate & Kidney. days post operative (69.23%) of our 26 surgically managed cases are clinically improved, (23.08%) have the same clinical picture, (7.69%) get worse, after 6 months, (70%) of cases are clinically improved (13.33%) have the same clinical picture, (13.33%) of cases died during these 6 months. 19 cases of the survived 26 case which followed for 1year, 14 of them (73.68%) clinically improved, 5 cases died (26.32%). of 26 surgically managed cases, 22 have posterior approach, 1 has anterior, 1 lateral & 2 have combined approach, of posterior group (72.73%) of cases are clinically improved, (18.18%) have the same clinical picture & (9.09%) get worse, of anterior group there is only 1 case and clinically improved, of lateral group there is only 1 case and clinically worsen, of combined group there are 2 case 1 of them (50%) clinically improved & the other case get worse. After 6 months (86.36%) of posteriorly approached cases are clinically improved, (9.09%) had the same clinical picture & (4.55%) died, of anterior group there is only 1 case and clinically improved, of lateral group there is only 1 case and clinically worsen, of combined group there are 2 case 1 of them (50%) clinically improved & the other case get worse. 18 of the survived surgically managed cases has been followed up for 1 year, 15 of them managed by posterior approach 12 case (80%) clinically improved, 3 cases (20%) died, the single case which managed laterally has been died among year post operative (100%), 2 cases which managed by combined approach 1 of them (50%) get improved & the other case died. correlation between clinical picture & clinical progress days post operative, 6months, 1year shows that the patients don't having neurological deficits shows better clinical progress at short & long terms.

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1. Introduction:

Spinal cord tumors account for about 15% of central nervous system neoplasms.¹ Primary spinal tumors are rare in comparison to metastatic spine tumors.² As regard metastases the thoracic spine is the most common site for tumor localization (45% to 70%).³

The majority of lesions that involve the spinal cord and meninges occur in the epidural space in the form of metastatic disease. The largest group of neoplastic spinal lesions that involve the spinal cord

and meninges occurs in the intradural-extramedullary space (40–50%), followed by the extradural space (30%) and the intramedullary space (20–25%).⁴

Spinal metastases occur in all age groups, with the highest incidence between age 40 and 65 years. The location of predilection is the thoracic spine (60% to 80%). Bone metastases, especially those of the spine, are most frequently observed in patients with cancer of the lung, prostate, breast, and hemopoetic organs.⁵

Back pain is the most common initial complaint. The back pain is usually diffuse and unrelated to activity, thus prolonging diagnosis until the pain becomes radicular or symptoms that are caused by cord or root compression ensue.⁴

Management of primary spinal tumors is heavily dependent on the tumor's histology. Benign primary spinal tumors can be managed conservatively or treated surgically with complete resection. Malignant primary spinal tumors are generally treated surgically with tumor excision.

Unlike the management of metastatic spinal tumors, the goal of treatment of a primary spinal tumor is to achieve lasting local tumor control for long-term survival or possible cure. En bloc tumor excision should be the first-line treatment of aggressive or invasive benign primary spinal tumors and almost all malignant primary spinal tumors. In cases in which en bloc tumor excision is not possible, subtotal tumor excision followed by adjuvant radiation therapy or chemotherapy (or both) is a viable alternative.²

Surgical treatment of primary and metastatic spine tumors may be indicated to alleviate pain, provide stability, and decompress the neural elements. The type, location, and degree of destruction of the tumor, as well as the overall treatment goals of surgery, determine whether the optimal approach is anterior, anterolateral, posterior, or combined anterior and posterior. For metastatic disease, it must be remembered that the primary goal of surgery is typically palliation, and the goal should be maximization of quality of life with minimization of surgical complications.⁶

Despite new developments in the surgical and radiotherapeutic fields, as well as in medical oncology, external beam radiotherapy is the cornerstone of the treatment of spinal metastases. In selected cases, surgical treatment is a proven option. Vertebroplasty or kyphoplasty can also be considered. After discussing the treatment options, an algorithm is given.⁵

We present a series of 30 cases of dorsal spine tumors managed surgically or conservatively between 2014-2016. most patients are operated by posterior approach & some of them are operated by anterior, lateral or combined anterior & posterior approaches.

The aim of surgery is tumor excision, decompression, anterior fixation, posterior fixation or combined. We present clinical picture, neurological function pre & post operative, management options, surgical approaches, and complications.

2. Patients and Methods:

This is a clinical trial (the results were compared in a prospective and retrospective randomized study),

including thirty patients with thoracic spine tumors, 17 males and 13 females with a mean age of 46.317 years.

1. The patient's history was carefully taken.

2. The patient was examined neurologically, lesion level determined and neurological deficit.

a. **Neurological examination** to evaluate the neurological status of the patient as:

1. Assessment of consciousness.

2. Motor system examination [muscle power in both right and left sides using Medical Research Council scale (MRC)]:

Grade 0: Total paralysis.

Grade 1: Visual or palpable contraction.

Grade 2: Active movement, gravity eliminated.

Grade 3: Active movement against gravity.

Grade 4: Active movement against resistance.

Grade 5: Active movement against full resistance.

3. Examination of sphincters including the control of voiding urine.

4. Examination of sensory system including superficial and deep sensation.

5. Examination of the spine "back" for: signs of trauma, tenderness, spasm, gap, kyphotic or scoliotic deformities and limited movement.

3. Radiological investigations including plain X-ray spine (Antero-posterior and lateral), Computed tomography and/or Magnetic resonance imaging spine (T1, T2 and gadolinium contrast) of thoracic spine.

4. Metastatic work up "for suspected 2ry tumors".

5. The patient was investigated preoperatively with CBC, PT, PTT, liver function tests and kidney function tests as a pre-operative evaluation.

6. Determining clinical factors:

◆ Onset of symptoms.

◆ Duration of symptoms.

◆ Degree of deficits.

And radiological factors:

◆ Extradural, intradural "extramedullary or intramedullary".

◆ extent of lesion (in relation to corresponding vertebrae)

7. 4 patients are managed conservatively.

8. 26 patient are managed surgically using microsurgical techniques. 22 case are operated by posterior approach, 1 case operated laterally, 1 case operated anteriorly & 2 cases operated by combined posterior & lateral approach. 15 case were operated for tumor excision, 5 case for decompression, 3 cases for decompression & posterior fixation, 1 case for anterior fixation & 2 cases have both anterior & posterior fixation.

9. Histopathological examination of the tumor tissue.

10. The patient was assessed neurologically one week following surgery and six months later to assess outcome of surgery and the results were conducted as improving, no change or deteriorating neurological functions.

11. 4 patients have received radiotherapy 2 of them received it post operative & 2 cases have it as Iry treatment. 1 case has received chemotherapy.

12. Patient data are collected. Demographic data, clinical presentation including first and presenting symptoms and clinical findings, imaging data including location and size of lesion, management option, surgical approach, aim of surgery and histopathological examination data are all collected in tables for correlation with outcome.

13. Patints presenting symptoms, used surgical approach, were correlated with neurological outcome inserted into tables for statistical analysis.

3. Results:

In our 30 cases 14 case (46.67%) presented by back pain, 6 cases (20%) presented by paraplegia, 2cases presented by paraparesis (6.67%), 4 cases (13.33%) presented by radiculopathy, 1 case presented by back pain & radiculopathy, 1 case presented by quadriparesis, 1 case accidentally discovered during family survey "for NFM type1".

25 cases (83.33%) have back pain, 21 cases (70.00%) have weakness, 20 cases (66.67%) have sensory deficit, 13 cases (43.33%) have sphencteric disturbance & 6 cases (20%) have radiculopathy.

16 cases (53.33%) were extradural, 11 case (36.67%) intradural extramedullary & 3 cases (10%) were intramedullary.

26 cases (86.67%) managed surgically while 4 cases (13.33) managed conservatively.

15 case (57.69%) operated for tumor excision, 5 case (19.23%) decompression, 3 cases have decompression & posterior fixation, 1 case (3.85%) have anterior fixation & 2 cases (7.69%) have both anterior & posterior fixation.

22 (84.62) operated posteriorly, 1 case (3.85) operated laterally, 1 case (3.85) operated anteriorly & 2 cases (7.69%) operated by combined posterior & lateral approach.

3 case (11.54) have post operative complications 1 case complicated by CSF leakage, 2 case have worsen motor power.

4 cases received radiotherapy (13.33%) 2 of them received post operative (6.665%) & 2 cases have it as Iry treatment. 1 case (3.33%) received chemotherapy.

22 (73.33), 8 cases (26.67) had secondary. pathology of Iry cases: 4 cases (13.33%) Meningioma, 3 cases (10%) Neurofibroma, 2 cases (6.67) Swannoma, Haemangioma, Plasma cell granuloma & Ependymoma, 1 case (3.33) Lipoma, Glioblastoma,

Multiple Myeloma, Atypical nerve sheath tumor, Vertebral angioma & Ewing's Sarcoma.

16 of our cases have extradural tumors, 8 cases (50%) of them are metastatic, 2cases (12.5%) have haemangioma, Plamacytoma, 1case (6.25%) have Lipoma, Multiple Myeloma, Vertebral angioma & Ewing's sarcoma. 11 cases of our 30 case were intradural extramedullary tumors, 4 cases (36.36%) were Meningioma, 3 cases (27.27) Neurofibroma, 2 cases (18.18%) Shwannoma, 1 case (9.09%) Atypical nerve sheath tumor & Metastases.

3 of our cases have intramedullary tumors, 2 of them (66.67%) have Epindymoma, 1 case (33.33%) has Glioblastoma.

of 9 metastatic cases, primary source was lung in 3 cases (33.33%), breast in 2 cases (22.22%), prostate & Kidney in 1 case (11.11%), 1 case was lymphoma (11.11%), the primary source can't be detected in 1 case (11.11%).

Clinical progress days post operative of the 26 surgically managed cases, 15 cases (57.69) are clinically improved, 9 cases (34.62%) have the same clinical picture, 2 cases (7.69%) get worse.

Clinical progress of all cases after 6 months, 21 cases (70%) are clinically improved, 1 case "which is discovered accidentally during family survey for NFM 1" still intact (3.33%), 4 cases have the same clinical picture (13.33%), 4 cases died during these 6 months.

Clinical progress after 1 y: Table: Shows clinical progress of 19 cases of the survived 26 case which followed for 1year, 14 of them (73.68%) clinically improved, 5cases died (26.32%). Correlation between surgical approach & clinical outcome days post operative of 26 surgically managed cases, 22 have posterior approach, 1 has anterior, 1 lateral & 2 have combined approach.

of posterior group 16 case (72.73%) clinically improved, 4 cases (18.18%) have the same clinical picture & 2 cases (9.09%) get worse.

of anterior group there is only 1 case and clinically improved, of lateral group there is only 1 case and clinically worsen, of combined group there are 2 case 1 of them (50%) clinically improved & the other case get worse.

of posterior group 19 case (86.36%) clinically improved, 2 cases (9.09%) have the same clinical picture & 1 cases (4.55%) died, of anterior group there is only 1 case and clinically improved, of lateral group there is only 1 case and clinically worsen, of combined group there are 2 case 1 of them (50%) clinically improved & the other case get worse.

18 of the survived surgically managed cases has been followed up for 1 year, 15 of them managed by posterior approach 12 case (80%) clinically improved, 3 cases (20%) died.

1 case managed laterally which died among year post operative, 2 cases managed by combined approach 1 of them (50%) get improved & the other case die. Correlation between presenting symptoms & clinical progress days post operative shows that (61.54%) of patients presented by back pain are clinically improved, (30.77%) have the same clinical picture while (7.69%) are worsen.

(60%) of patients presented by paraplegia improved, (40%) have the same picture. of patients presented by paraparesis & radiculopathy (50%) improved & (50%) the same.

Correlation between presenting symptoms & clinical progress after 6 months: shows that (71.43%) of patients presented by back pain are clinically improved, (21.43%) have the same clinical picture while (7.14%) worsen. of patients presented by radiculopathy (75%) improved & (25%) the same.

(66.67%) of patients presented by paraplegia improved, (33.33%) are died. all patients presented by paraparesis are improved. Correlation between presenting symptoms & clinical progress after 1y shows that (77.78%) of patients presented by back pain are clinically improved, (22.22%) are died.

(50%) of patients presented by paraplegia improved, (50%) are died. all patients presented by paraparesis & radiculopathy are improved.

11 cases (36.67%) died by end of the study, ranging from 4months till 5years, the majority of them were metastatic (72.73%) & all had malignant tumors.

4. Discussion:

In our study on 30 cases of thoracic spine tumors, 56.67% of cases were females and 43.33% were males.

The mean age was 46.317y (range, 1.5 to 75 years), this is nearly as in literatures as *Engelhard et al. (2010)*⁷ which there is 430 case 56.7% females & 43.3% males, the main age was 49.3y.

In our study the most common presenting symptom was back pain (46.67%), followed by weakness (30%), (13.33%) are presented by radiculopathy.

Back pain was the most common initial symptom in *Jemmella et al 2005*⁸ (42%) followed by different grades of motor weakness (38%) then radiculopathy (26%).

Upon diagnosis (76.67%) of our cases have back pain, as in *Engelhard et al. (2010)*⁷ the most common symptom was back pain followed by weakness, (73.33%) have weakness, (60%) have sensory deficit, (43.33%) have sphencteric disturbance & (20%) have radiculopathy.

That is nearly what *Arura & Kumar (2015)*⁹ found in sereis of 111 patient as (70.27%) manifested

by weakness, (59.54%) have sensory abnormalities, (42.24%) have sphencteric disturbance.

Tumor in (53.33%) of our cases were extradural, (50%) of them are metastatic, (12.5%) haemangioma, Plamacytoma, (6.25%) Lipoma, Multiple Myeloma, Vertebral angioma & Ewing's sarcoma.

Literatures also shows that metastases represent the most common pathological variant in extradural tumors of the spine and exactly in thoracic spine. *Arura & Kumar (2015)*⁹, *Avramov, et al (2009)*¹⁰.

(36.67%) was intradural extramedullary, (36.36%) of them were Meningioma, (27.27) Neurofibroma, (18.18%) Shwannoma, (9.09%) Atypical nerve sheath tumor & Metastases.

(10%) intramedullary, (66.67%) of them were Epindymoma, (33.33%) were Glioblastoma grade IV.

*Arura & Kumar (2015)*⁹ results nearly as our results, as the major diagnosis in extradural cases was metastases, in intradural extramedullary was shwannoma & neurofibroma & menigioma (30%,26.67%,17.5%), in intramedullary tumors the major diagnosis were ependymoma & astrocytoma (41.46%, 26.83%).

In our study (86.67%) of cases are managed surgically while (13.33%) are managed conservatively. that what the literature states that the surgery is the 1st management option for most cases of spine tumors if no marked risks or contraindications, as in *Engelhard et al. (2010)*⁹, *Vaillant & Loghin (2009)*.¹¹

(57.69%) of our cases operated for tumor excision, (19.23%) have decompression, (11.54%) have decompression & posterior fixation, (3.85%) have anterior fixation & (7.69%) have both anterior & posterior fixation.

*Arura & Kumar (2015)*⁹ also done tumor total excision for (51.53%) of cases, decompression for (19.81%).

(84.62%) of our surgically managed cases are operated by posterior approach, (3.85%) are operated laterally, (3.85%) are operated anteriorly & (7.69%) operated by combined posterior & lateral approach.

The posterior approach is the most commonly used approach in literatures as in *Engelhard et al. (2010)*⁷, in *Avramov, et al (2009)*¹⁰ (91.18%) of cases are operated by posterior approach, (13%) have transpedicular fixation, (21%) have anterior fixation.

The percent of post operative complications in our study was (15.38%) totally 4 cases of 26 surgically managed cases, 1 case complicated by CSF leakage, 1 case has persistant radiculopathy & 2 case have worsen motor power. this percent is within that in literatures as *Arura & Kumar (2015)*⁹ (18.2%), *Avramov, et al (2009)*¹⁰ (11.84%) *Nakamura, et al (2008)*¹³ (12%).

(13.33%) of our cases have received radiotherapy (50%) of them received it post operative & (50%) have it as 1st treatment, only (3.33%) of cases have received chemotherapy.

In *Engelhard et al. (2010)*⁷ (20.3%) of cases received radiotherapy most of them received it post operative, (5.6%) of cases received chemotherapy.

Primary source of metastases in our study was the lung in (33.33%) of metastatic cases, breast in (22.22%), prostate & Kidney in (11.11%), (11.11%) were lymphoma while in (11.11%) the primary source were unknown.

Literatures also shows that the most common source of spine metastases is the lung, breast, prostate & kidney as in *Bartels, et al (2008)*⁵, *Tomita, et al (2001)*¹².

Days post operative (69.23%) of our 26 surgically managed cases are clinically improved, (23.08%) have the same clinical picture, (7.69%) get worse, after 6 months, (70%) of cases are clinically improved, 1 case "which is discovered accidentally during family survey for NFM 1" still intact (3.33%), (13.33%) have the same clinical picture, (13.33%) of cases died during these 6 months. 19 cases of the survived 26 case which followed for 1 year, 14 of them (73.68%) clinically improved, 5 cases died (26.32%).

In *Avramov, et al (2009)*¹⁰ (52.45%) of cases had improved post operative, (43.44%) had the same clinical picture as pre operative & (4.09%) get worse. in *Arura & Kumar (2015)*⁹ after period of follow up "mean 1.5y" (79.92%) of cases are clinically improved by variable degrees, (15.31%) as pre operative & (5.41%) are deteriorated.

Of 26 surgically managed cases, 22 have posterior approach, 1 has anterior, 1 lateral & 2 have combined approach, of posterior group (72.73%) of cases are clinically improved, (18.18%) have the same clinical picture & (9.09%) get worse, of anterior group there is only 1 case and clinically improved, of lateral group there is only 1 case and clinically worsen, of combined group there are 2 case 1 of them (50%) clinically improved & the other case get worse.

After 6 months (86.36%) of posteriorly approached cases are clinically improved, (9.09%) had the same clinical picture & (4.55%) died, of anterior group there is only 1 case and clinically improved, of lateral group there is only 1 case and clinically worsen, of combined group there are 2 case 1 of them (50%) clinically improved & the other case get worse.

18 of the survived surgically managed cases has been followed up for 1 year, 15 of them managed by posterior approach 12 case (80%) clinically improved, 3 cases (20%) died, the single case which managed laterally has been died among year post operative (100%), 2 cases which managed by combined

approach 1 of them (50%) get improved & the other case died.

Results of posterior approach are similar to that in literatures according to clinical progress, complication & mortality as in *Arura & Kumar (2015)*⁹ which study 111 cases of spine tumors operated by posterior approach, follow up "mean 1.5y" (79.92%) of cases are clinically improved by variable degrees, (15.31%) as pre operative & (5.41%) are deteriorated.

Literatures also shows that anterior & lateral approaches carries more risks of complications & mortality than posterior approach, as *Campbell, et al (2010)*¹⁴.

Correlation between clinical picture & clinical progress days post operative, 6 months, 1 year shows that the patients don't having neurological deficits shows better clinical progress at short & long terms, that what literatures said also, as in *Arura & Kumar (2015)*⁹.

5. Conclusion:

Treatment of spine and spinal cord tumors is complex and a multidisciplinary approach is required. Contemporary treatment include surgery, radiation therapy and chemotherapy. Outcome is dependent upon a number of factors. These factors are: the site of tumor compression within the spinal canal, the histological characteristics of the tumors, the tempo of neurologic progression, patient age, comorbidity, tumor extension, involvement of neighbour structures and organs, etc.

Early recognition of the signs and symptoms of spinal tumors facilitates early diagnostic evaluation and treatment, potentially minimizes neurologic morbidity, and may improve outcome. Pain is the predominant symptom of spinal tumors and often persists after treatment. Primary treatment of spinal tumors is surgical resection and predictors of outcome include preoperative functional status (limited to no neurologic deficit predicts for better outcome), histologic grade of tumor (lower grade predicts for improved survival), and extent of surgical resection (image-verified complete resection improves survival).

Factors of relevance when choosing between surgery and other treatment modalities include: the extent of pain, the neurological deficit, the primary tumor's sensitivity to radio- or chemotherapy, the dissemination of the disease "for metastases", and the general condition of the patient.

Furthermore, spinal instability and the technical feasibility of surgical decompression and stabilization need to be taken into account.

The indication for surgery may be neurological deficit, or pain without epidural compression of the spinal cord. If there is major neurological deficit, only

surgery can reliably and quickly restore function, Surgical treatment, based on decompression of the spinal cord together with restoration of spinal stability, may reduce pain and reestablish function.

Selection of surgical approach depends also on multiple factors such as: tumor location according to the cord, tumor size, aim of surgery, patient general condition & expected survival & improvement.

Comparison between different approaches for thoracic spine tumors still needs more researches as in clinical practice each approach usually used for different group of patients.

The role for chemotherapy for spinal cord tumors is still poorly defined.

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