

Surgical Correction of D12 Hemivertebra induced Gross Kyphoscoliosis

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A 14 years old male child presented to the department of Orthopedics, King Edward Memorial Hospital, Mumbai in September 2019, with severe deformity of his spine (**Figure 1**). He also complained of difficulty in standing and walking along with severe backache. Investigations revealed a D12 hemivertebra with resultant gross kyphoscoliotic deformity compressing the spinal cord (**Figures 2 - 9**). The child was treated by an 11 hour long corrective surgery, during which continuous neuro-monitoring was done (**Figures 10A – H**). He underwent resection of the D12 hemivertebra and insertion of a titanium cage with bone graft. The kyphoscoliotic deformity was corrected following vertebral column resection & posterior instrumentation with pedicular screws and rods (**Figure 11**). He had an uneventful operative and postoperative course. He was given physiotherapy in the form of gait training & trunk stabilization exercises with full weight bearing. He was given a whole body contact brace at discharge on postoperative day 16. The patient reported improvement of weakness in both the lower limbs along with an excellent cosmetic outcome (**Figures 12 & 13**). This surgery was carried out free of cost under 'Pradhan Mantri Jan Arogya Yojana (PMJAY)' scheme.



Figure 1. Preoperative clinical photographs of child's front (A), side (B) and back (C) view showing gross kyphoscoliotic deformity with right sided convexity.

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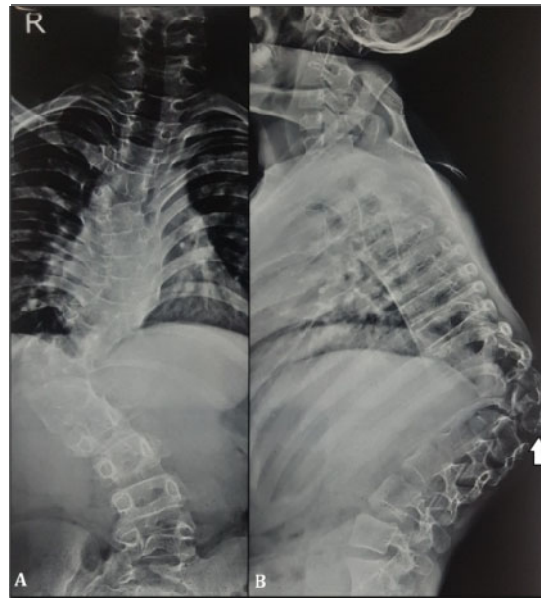


Figure 2. Preoperative radiograph anteroposterior view (A) and lateral view (B) of spine showing gross kyphoscoliotic deformity with right sided convexity and D12 hemivertebra (white arrow).

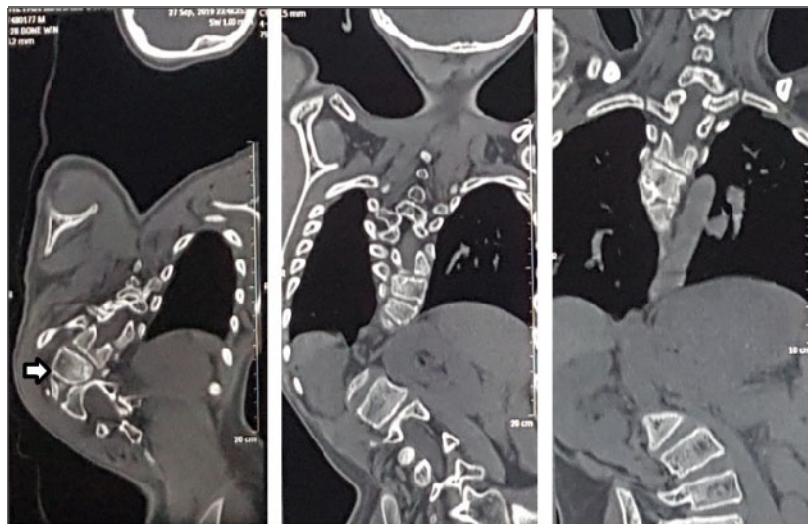


Figure 3. Preoperative serial CT scans (coronal view) of spine showing kyphoscoliotic deformity with right sided convexity in coronal plain (arrow pointing towards D12 hemivertebra).

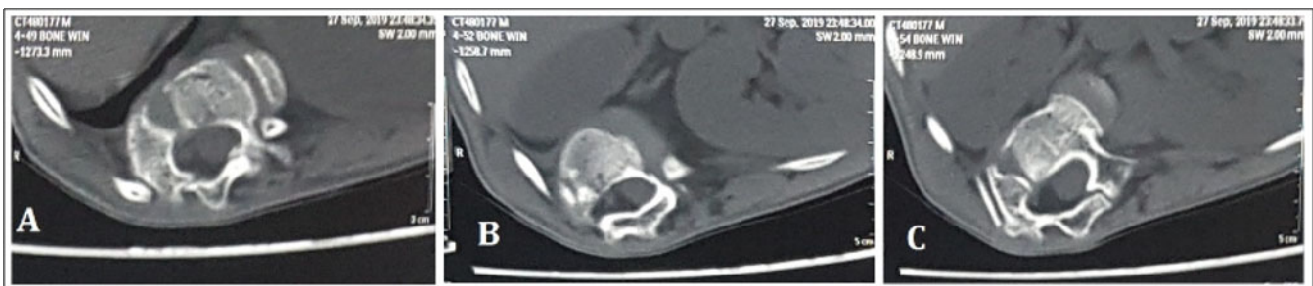


Figure 4. Preoperative serial CT scans (axial view) at D11 (A), D12 (B) and L1 (C) vertebral levels showing rotational deformity of vertebrae.

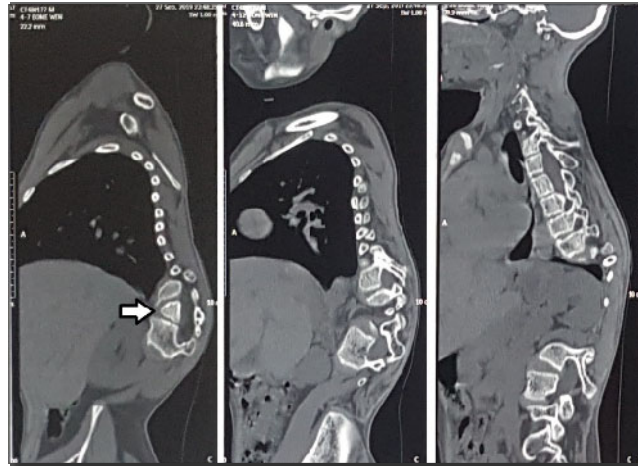


Figure 5. Preoperative serial CT scans (sagittal view) of spine showing kyphoscoliotic deformity with right sided convexity (arrow pointing towards D12 hemivertebra). Note the vertebral dysplasia and malalignment.

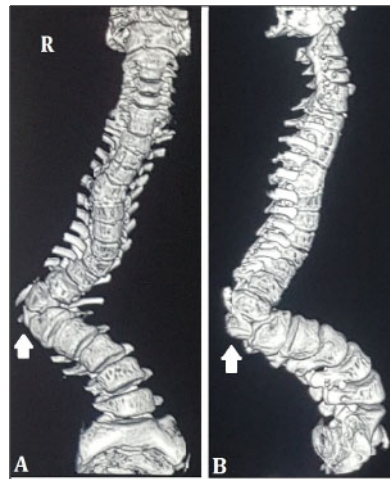


Figure 6. Preoperative 3D CT surface reconstruction of vertebral column showing kyphoscoliotic deformity with right sided convexity (arrow pointing towards D12 hemivertebra).

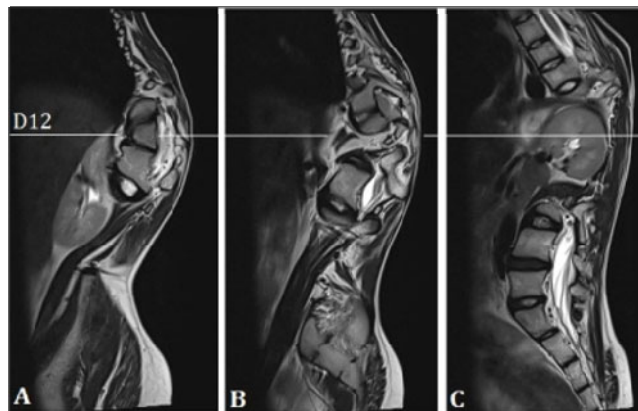


Figure 7. Preoperative serial Magnetic Resonance Imaging (sagittal view) of spine showing D12 right hemivertebra with resultant gross kyphoscoliotic deformity with right sided convexity (line drawn at D12 level). Spinal cord is stretched along the deformity. Compensatory curves are seen.

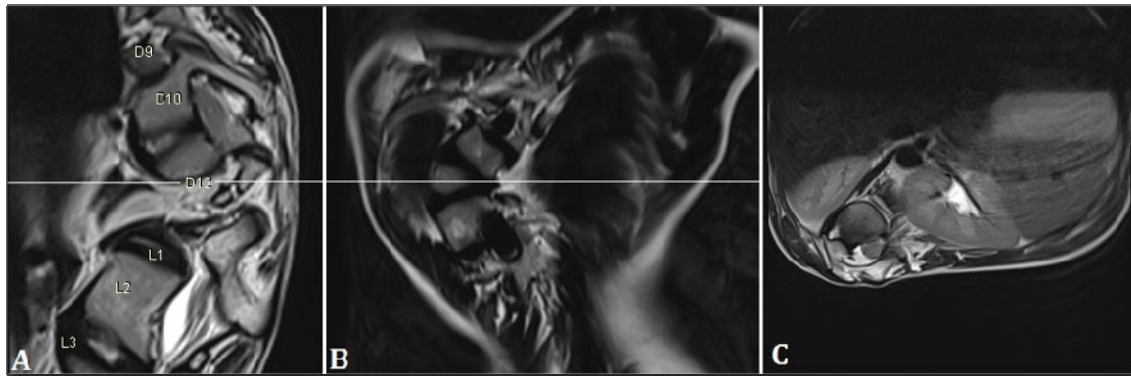


Figure 8. Preoperative serial Magnetic Resonance Imaging saggital view (A), coronal view (B) and axial view (C) of spine showing kyphoscoliotic deformity with right sided convexity (line drawn at D12 level).

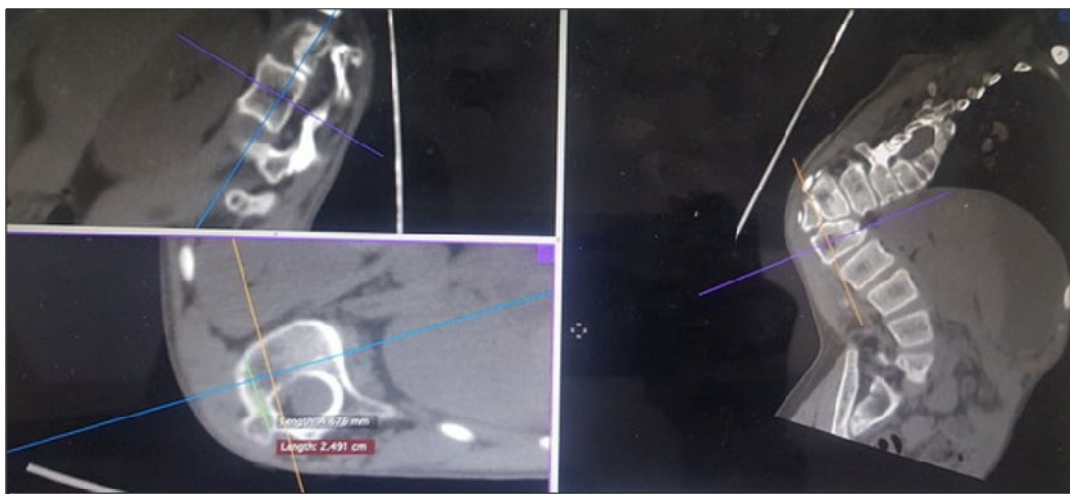


Figure 9A. Measurement of degree of rotational deformity of vertebral column using preoperative CT scans of spine.

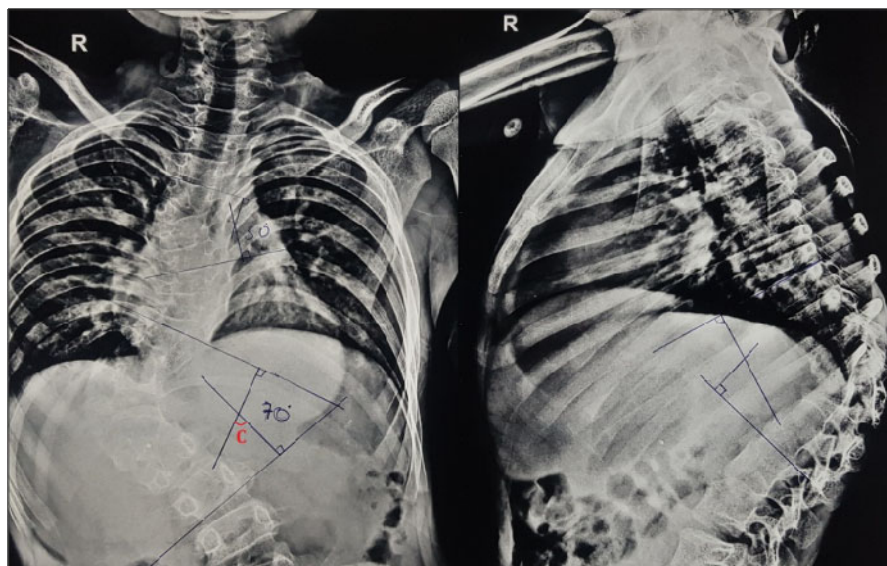


Figure 9B. Measurement of degree of rotational deformity of vertebral column using preoperative anteroposterior and lateral radiographs of spine. Extent of curvature of spine given by Cobb's angle (C) = 70°.

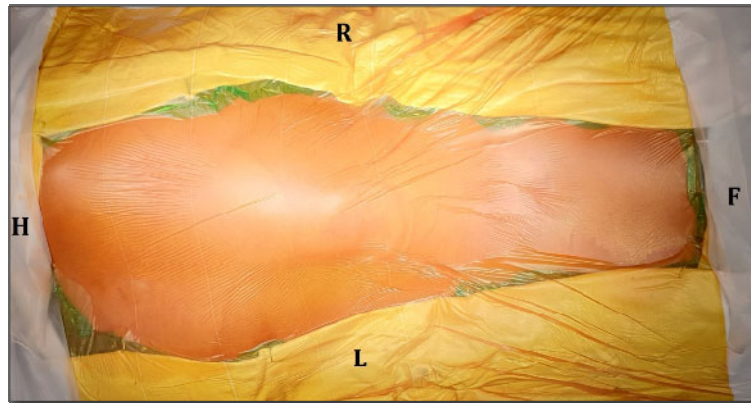


Figure 10A. Intraoperative photograph of surgical site painted and draped from lower end of neck to coccyx. Patient was in prone position, under general anesthesia. Continuous neuromonitoring was done throughout the surgery (H: Head End; F: Foot End; R: Right Side; L: Left Side).

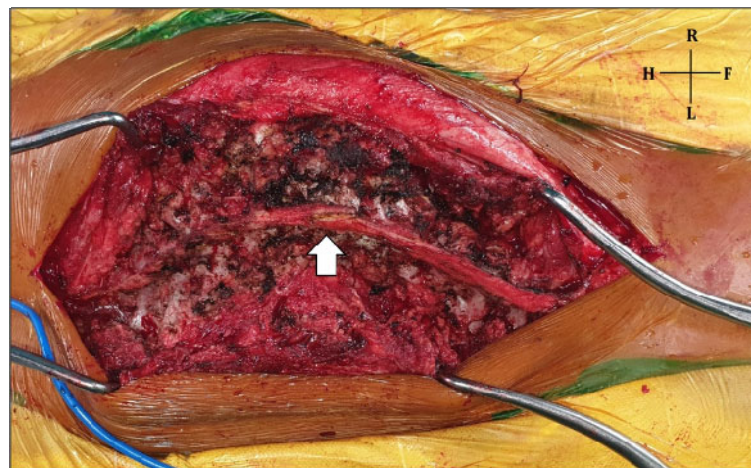


Figure 10B. Intraoperative photograph showing the spinous processes of vertebrae along with the supraspinous ligament (white arrow) seen after taking an incision over the skin, midline along the curve, centering over the spinous processes and then reflecting and dissecting the paraspinal muscles laterally. (H: Head End; F: Foot End; R: Right Side; L: Left Side).

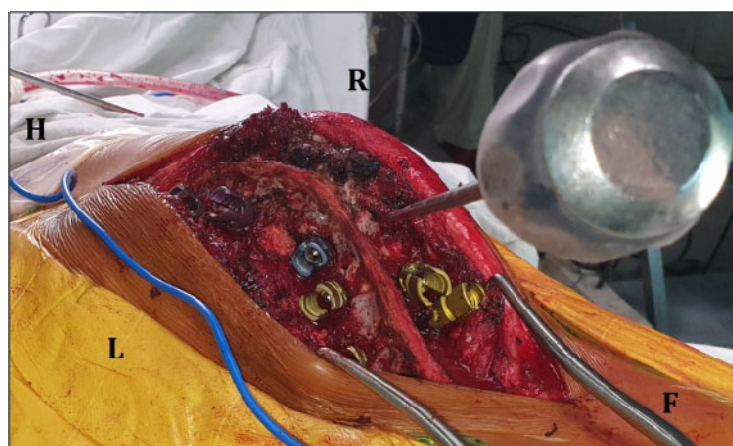


Figure 10C. Intraoperative photograph depicting the process of posterior instrumentation with pedicular titanium screws done bilaterally at D8, D9, D10, L2 and L3 vertebral levels and on left side at D11 and L1 vertebral levels. (H: Head End; F: Foot End; R: Right Side; L: Left Side).

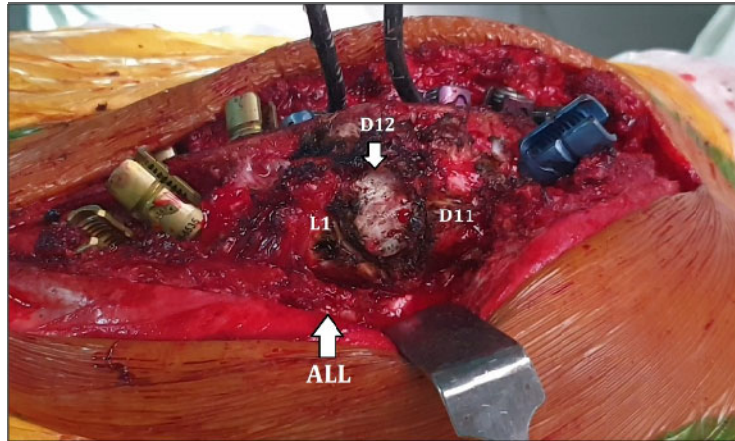


Figure 10D. Intraoperative photograph showing exposed the D12 incarcerated hemivertebra which is to be excised. The Anterior Longitudinal Ligament (ALL) which has been released completely can be appreciated.

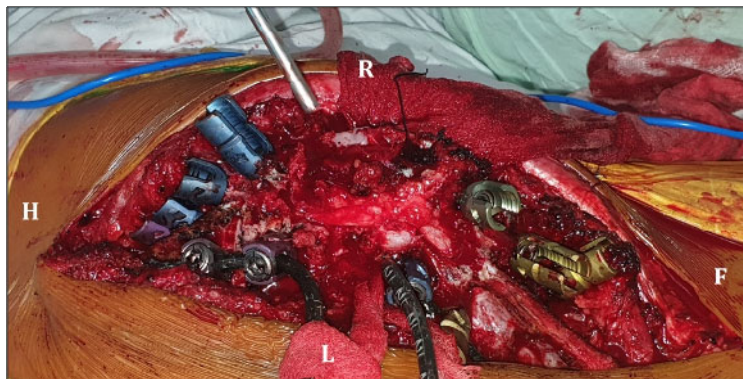


Figure 10E. Intraoperative photograph after performing laminectomy from level D10 to L1. (H: Head End; F: Foot End; R: Right Side; L: Left Side).

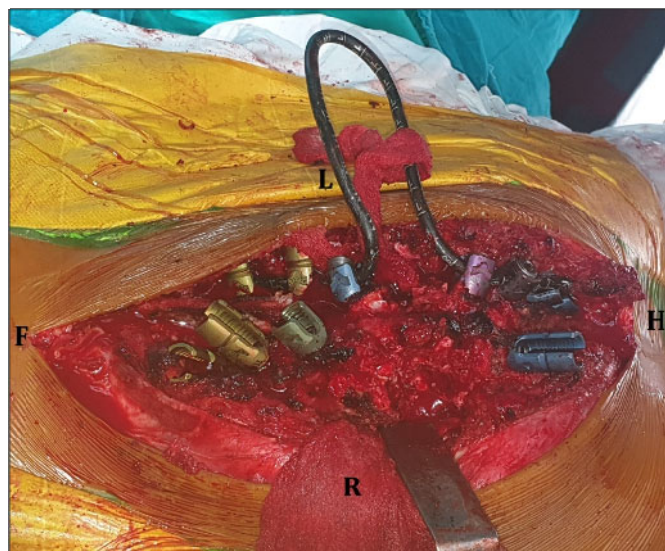


Figure 10F. Intraoperative photograph after excision of D12 hemivertebra using transpedicular approach from covex (right) side. After this, D11 and L1 end plates were prepared and a cage with bone graft was inserted from right side. (H: Head End; F: Foot End; R: Right Side; L: Left Side).

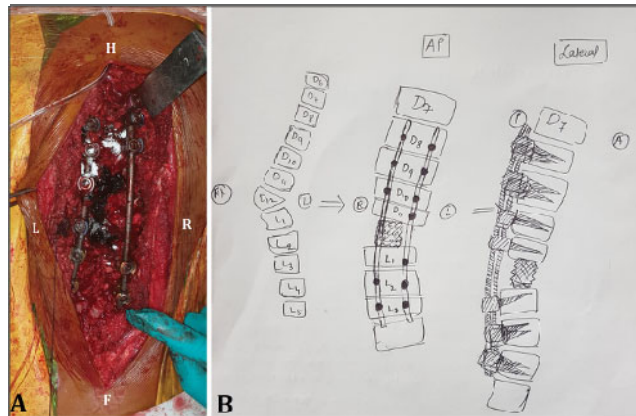


Figure 10G. Intraoperative photograph (A) along with its diagrammatic representation (B) depicting correction of deformity using Cantilever maneuver with the help of titanium rods (gradual compression, distraction and rod rotation). (H: Head End; F: Foot End; R: Right Side; L: Left Side).

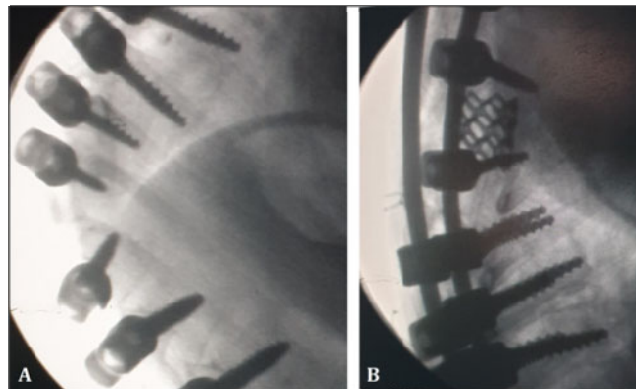


Figure 10H. Fixation and position of cage confirmed intraoperatively using a C-arm.

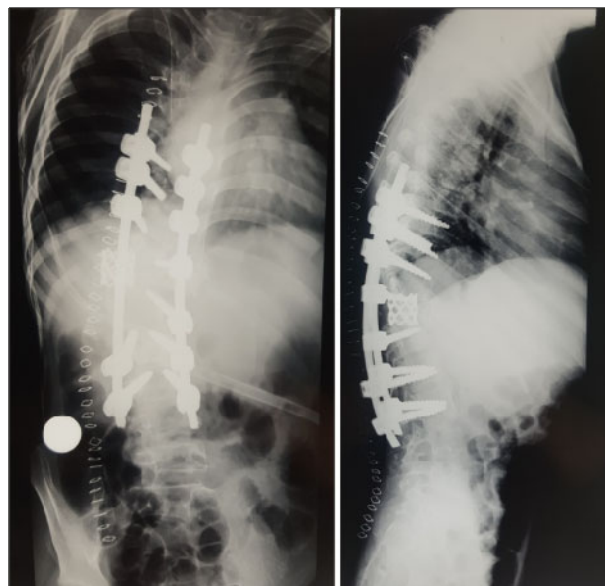


Figure 11A. Postoperative day 2 radiograph anteroposterior and lateral view of spine depicting correction of kyphoscoliosis with cage, bone graft, pedicular screws and titanium rods in place.

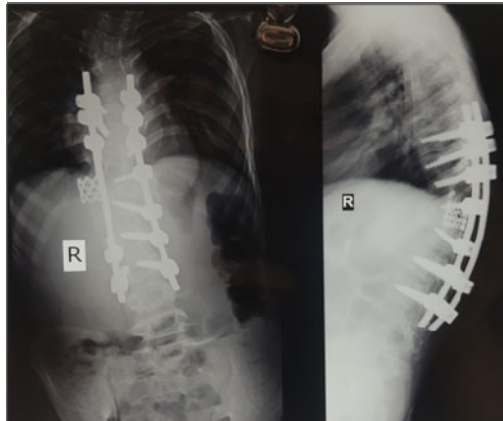


Figure 11B. Postoperative day 14 radiograph anteroposterior and lateral view of spine depicting correction of kyphoscoliosis with cage, bone graft, pedicular screws and titanium rods in place.



Figure 12. Postoperative day 14 clinical photographs of child front (A), side (B) and back (C) views depicting complete correction of kyphoscoliosis with minimal surgical scar on the back.



Figure 13A. Comparative image showing preoperative (A) and postoperative day 14 (B) clinical photographs of front view of child depicting complete correction of kyphoscoliosis.



Figure 13B. Comparative image showing preoperative (A) and postoperative day 14 (B) clinical photographs of side view of child depicting complete correction of kyphoscoliosis.



Figure 13C. Comparative image showing preoperative (A) and postoperative day 14 (B) clinical photographs of back view of child depicting complete correction of kyphoscoliosis with minimal surgical scar.