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Case Report

Physiotherapy Section

Comprehensive Physiotherapeutic Approach in Managing Lumbar Schmorl's Node: A Case Report

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BY-NC-ND

ABSTRACT

Schmorl's nodes are indicative of Intervertebral Disc (IVD) protrusion into the vertebral body, with epidemiological predominance of 76% amongst males. The condition is usually asymptomatic with rare presentation of pain in few cases, making Non steroidal Anti-inflammatory Drugs (NSAIDs) and physiotherapeutic management as typical line of treatment. Although physiotherapy is helpful in this condition, studies are scarce with set physiotherapeutic interventions lacking. This case report presents a 30-year-old male having lower back ache (LBA) with Schmorl's nodes at the superior endplate of L3 vertebral disc. Therefore, this case report highlights the importance of a comprehensive physiotherapeutic approach including a combination of electrotherapy, manual therapy, exercise therapy, and education on posture as well as ergonomics. Significant improvement in Low Back Pain (LBP) {Numerical Pain Rating Scale (NPRS)}, strength of core and lower extremity {Manual Muscle Testing (MMT)}, functional outcome {Oswestry Disability Index (ODI)} and Quality of Life (QoL) {Short Form Health Survey (SF-36)} were noted after six weeks of intervention. Further research is warranted to validate the effectiveness of this approach in a larger patient population.

Keywords: Comprehensive physiotherapy, Intervertebral disc, Low back pain, Rehabilitation

CASE REPORT

A healthy 30-year-old male patient presented to the rheumatology division of a hospital in Gurugram, Haryana, with a complaint of pain in the lumbar region describing it to be diffused, nagging and non-radiating, which gradually developed from the last two months. Medical history given by the patient revealed a sudden onset of back pain with muscular origin, which the patient assumed would diminish with rest and painkillers (Ultracet SOS). Soon he realised that the pain was long standing and worsening with time even after rest and medications. As he had a sitting job, prolonged sitting during working hours exacerbated his symptoms. He rated it as 8/10 on intensity at rest and 10/10 on movement.

Over the following 1-2 weeks, this pain worsened suddenly to 9/10 at rest on NPRS. He did not experience any paresthesia or numbness.

All clinical findings were normal apart from restriction of lumbar ROM due to intense back pain, no neurological abnormalities were noted, and routine laboratory results were found to be normal. Furthermore, plain film of the lumbar spine showed no abnormalities.

Due to sudden increase in severity of the symptoms, further imaging studies were performed. Sagittal plain Magnetic Resonance Imaging (MRI) showed a Schmorl's node on the superior endplate of L3 vertebra, with degeneration of L2-L3 disc [Table/Fig-1].

The patient was treated conservatively by bed rest and analgesic medications. Medications given included Ibuprofen and Neucoxia-MR, two times a day for 15 days alongside Shelcal 500, one time a day for six weeks.

Diclofenac gel was given for topical use. Two weeks later, the patient's symptoms improved. Patient provided no history of such familial cases of Schmorl's nodes. Socioeconomic history revealed that the patient belonged to an upper middle-class family according to modified Kuppuswami Scale [1]. On observation, the patient seemed anxious with the diagnosis made for his symptoms but cooperated well with the therapist during physiotherapeutic assessment. Patient gave no surgical or medical history of any other illness.

After a month, the symptoms again aggravated and he was referred to a physiotherapist. A thorough examination was done. The [Table/Fig-2] represents systemic and general evaluation, [Table/Fig-3] shows detailed Muscle charting using Kendall's muscle Testing [2] and [Table/Fig-4] gives detailed functional evaluation using Straight Leg Raise (SLR) [3], Deep Tendon Reflexes (DTRs) [4], MMT [2], ODI [5], SF-36 [6]. [Table/Fig-4] shows the improvement in QoL using SF-36 [6] scale. Follow-up was conducted through telephonic conversations every 15 days during which the patient's symptoms showed improvement.

[Table/Fig-1]: Schmorl's node on superior endplate of L3 vertebra, with degeneration of L2-L3 disc.

Assessment: Detailed assessment at initial stage, after discharge from Out Patient Department (OPD) (post- 7 weeks) and after home exercises programme (post- 12 weeks) is given in [Table/Fig-2].

Muscle strength evaluation pre and post rehabilitation is described in [Table/Fig-3].

Functional evaluation pre and post rehabilitation is given in detail in [Table/Fig-4].

Evaluation of QoL using SF-36 pre and post rehabilitation is described in detail in [Table/Fig-5] [6].

Treatment: Goal-oriented physiotherapy intervention at different durations, along with treatment goal, therapeutic interventions and dosages are given in detail in [Table/Fig-6] [7-10].

Test and measures	Initial	After discharge from OPD (Post- 7 weeks)	After home exercises program (Post- 12 weeks)
Vitals (HR; BP and RR)	HR- 75 bpm BP- 130/80 mmHg RR- 15 breaths per min		
BMI	25 kg/m^2	25 kg/m^2	25 kg/m^2
Active Range of Motion (AROM)	All bilateral U/L and L/L AROM were complete except hip flexion extension; abdomen flexion and extension due to pain.	All bilateral AROM improved, almost completing the ranges.	Gained full Range of Motion (RoM)
Passive Range of Motion (PROM)	PROM was restricted when passively flexing the L-S spine and hip flexion giving an empty end feel with muscle guarding.	PROM was complete.	Improved end feel (normal to joint specific)
Posture	Developed a flat back type posture due to pain and stiffness of muscles.	Posture improved; lumbar lordosis visible on sagittal view analysis.	More flexible and toned posture.
Locomotion/ gait	Ambulating on self but with stiffness and lacking motion at back.	Observational analysis shows improved gait quality. Quantitively, spatial parameter of gait improved namely cadence, stride and step length.	Maintained the previous parameters, also improved cadence.
Pain (NPRS)	At rest: 7/10; At activity: 10/10	At rest: 1/10; At activity: 2/10	No pain, all movements were pain-free.

[Table/Fig-2]: Systemic and general evaluation pre and post rehabilitation.
HR: Heart rate; BP: Blood pressure; RR: Respiratory rate; BMI: Body mass index

Manual Muscle Testing (MMT) [2]						
	Initial		Post-intervention		Discharge	
Muscle group	Left	Right	Left	Right	Left	Right
Trunk flexor	2		3		4	
Trunk extensor	2		3		4	
Hip flexor	(3)	(3)	(4)	(4)	5	5
Hip extensor	(3)	(3)	(4)	(4)	4	4
Hip abductor	(3)	(3)	3	3	4	4
Hip adductor	(3)	(3)	4	4	5	5
Hip IR	(3)	(3)	4+	4+	5	5
Hip ER	(3)	(3)	4+	4+	5	5
Knee flexor	4	4	5	5	5	5
Knee extensor	5	5	5	5	5	5
Ankle dorsiflexor	4	4	5	5	5	5
Ankle planter flexor	4	4	5	5	5	5

[Table/Fig-3]: Muscle strength evaluation pre and post rehabilitation.
( ): Means MMT checked within available range (restricted due to pain)

Test and measures	Initial	OPD discharge (Post- 7 weeks)	After home exercises (Post- 12 weeks)
SLR [3]	Negative (B/L)	Negative (B/L)	NA
DTRs [4]	2+	2+	NA
Manual Muscle Testing (MMT) [2]	Weakness of abdomen flexors, hip muscles, spine extensors and hamstrings detected with grades (2/5)	All muscles regained "4/Good" muscle strength (Kendall).	4+/5 in all the weak muscles assessed initially.
ODI [5]	32 (Severe disability)	11 (Mild disability)	3 (Minimal disability)
SF- 36 [6]	Health status is poor in almost all domains (details attached)	Not filled	Improvement in health and in all domains (details attached)

[Table/Fig-4]: Functional evaluation pre and post rehabilitation [2-6].

SF-36 domain scores		
Category	Pre-score	Post score
Physical functioning	15	90
Role limitations due to physical health	0	100
Role limitations due to emotional problems	0	66.7
Vitality	35	65
Emotional well-being	20	84
Social functioning	0	87.5
Pain	12.5	77.5
General health	10	80
Health change	25	75

[Table/Fig-5]: Evaluation of Quality of Life (QoL) using SF-36 pre and post rehabilitation.

Home based rehabilitation protocol for Schmorl's node [8,11,12] are described in details in [Table/Fig-7].

Therapist mobilising the lumbar spine- PA glide over L-3 transverse process is shown in [Table/Fig-8].

The patient's progress was tracked using several measures: the NPRS for pain, the ODI for disability, and the SF-36 questionnaire for QoL [Table/Fig-9-11]. Measurements were taken at baseline (pre-intervention), after discharge from the 7-week outpatient physiotherapy programme (post-7 weeks), and following the 5-week home exercise programme (post-12 weeks).

Pain: At baseline, the patient reported severe pain, scoring 7/10 at rest and 10/10 during activity. Following the 7-week physiotherapy programme, pain scores decreased significantly to 1/10 at rest and 2/10 at activity. After the additional five weeks of home exercises, the patient reported no pain during activity and rest (0/10).

- Scores are out of 10.
- NPRS data shows pain and discomfort reduced drastically from severe to no pain.

Disability: The patient's initial ODI score of 32/50 indicated severe disability. This score improved substantially to 3/50 after the combined physiotherapy and home exercise programme, suggesting a reduction to mild disability.

- Scores are out of 50.
- ODI data shows disability reduced drastically from severe to mild disability.

Quality of Life (QoL): The SF-36 assesses various aspects of health and well-being. While the specific domains measured are not explicitly labelled in the graphs, the data show improvement across all domains. Pre-intervention scores were relatively low, indicating a diminished QoL. Post-intervention scores increased across all domains, reflecting a substantial improvement in the patient's overall well-being.

- Scores are out of 100.
- Higher score is better domain health.
- SF-36 data show QoL improved in various domains.

DISCUSSION

In 1920s, Dr. Christian George Schmorl depicted this "unique" lesion, Schmorl's node as the herniation of nucleus pulposus through the cartilaginous and bony end plate into the body of an adjacent vertebra [13].

Literature search stated that prevalence ranges from 3% to 75% [14]. Trauma or stress transmitted through a weakened endplate is the most commonly accepted pathophysiology of Schmorl's node formation [15].

The condition is mostly asymptomatic but those who suffer the symptoms have an intense back pain impacting the QoL of the individuals [16]. It has been discovered that Schmorl's node are linked to disc degeneration and back pain [17].

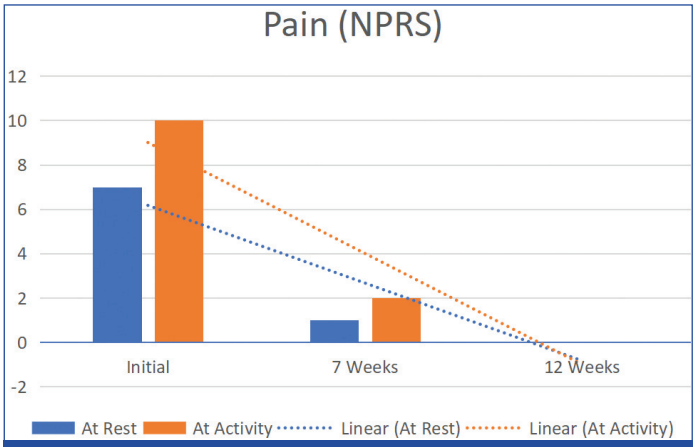
Duration	Treatment goals	Therapeutic interventions	Dosage
Phase- I 1st- 2nd Week [7,8]	To educate the patient about his condition. To reduce dependency on analgesics by alleviating pain and discomfort. To relax and release the tight and tender muscles. To improve RoM of Throacolumbar Spine (TLS) spine.	IFT: To target deeper musculature STM: Release soft tissues facilitate lymphatic drainage Effleurage: Drain ECF and sooth soft tissues. Sustained stretches. Cryotherapy: For pain and inflammation.	4-pole vector; F: 4000 Hz; D: 100 µs; 15 minutes. MFR; 8-10 strokes; medial to lateral over paraspinal muscles. Caudo- Rostrally directed; ending at shoulder. Passively; Knee to chest; Hamstrings; Ilio-Psoas; Latissimus dorsi; 3 x 15 secs Soft cryogelly packs; 10 minutes
Phase- II 3rd-5th Week [8,10]	To improve strength of affected muscles. To improve spino-pelvic mobility. To retrain the spine extensor muscles. To improve posture of the individual.	Traction: Increase the intervertebral space. Reduce pain and discomfort. Mobilisation: Maitland Brisk walk: for 3000- 5000 steps. MET: To retrain Multifidus; erector spinae Postural alignment: To retain good alignment Mobility exercises: Cat and camel; Pelvic rolls; Pelvic bridging; Self stretches	Manually; using mobilisation belt; in 90-90 position; sustained for 60 seconds; 5 times. Grade 1, 2 and 3; PA over spinous & Tr process of T12; L1-L5. In prone and side lying; PIR technique; 10 sec holds; 5-6 times. Repeat several times to ease movements. 10-15 times; Stretch hold for 15 secs.
Phase-III 5th-7th Week [8-10]	To improve strength of affected muscles. To retrain the spine extensor muscles. To improve occupational capacity and working potential.	Progressive resisted exercises. Stretching exercises to gastrocnemius, soleus, and hamstrings muscles. Neural mobilisation for the sciatic nerve. Posture correction exercises continued as in Phase-II included shoulder retraction exercises, scapular mobility etc. Phase-II intervention and exercises with increase intensity, reps and hold time	1-kg progressed to 2- kg weight cuff to bilateral muscles of lower extremities. 5-7 Reps each leg.
Phase-IV 8th-12th Week (Home based rehabiliation)	To maintain the exercise routine. To reduce fatiguability. To improve cardiovascular capacity, endurance, balance and coordination.	A progressive program using functional exercises was used.	

[Table/Fig-6]: Goal-oriented physiotherapy intervention.
IFT: Interferential therapy; STM: Soft Tissue Manipulation; ECF: Extracellular Fluid; PA: Posteroanterior; Tr: Transverse; MFR: Myofascial release; PIR: Post-isometric relaxation; MET: Muscle energy technique

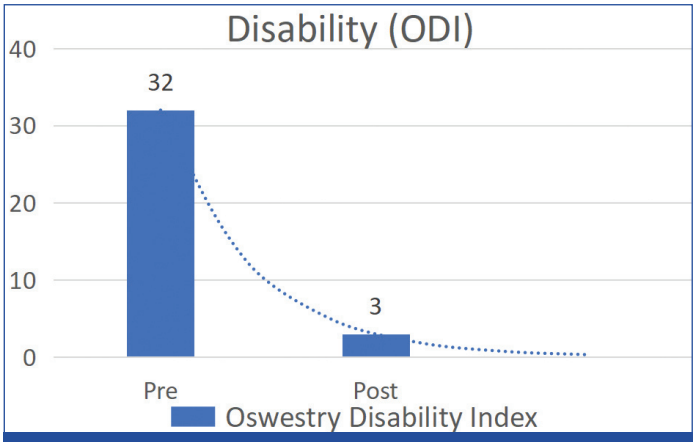
Type/ exercise	Frequency	Intensity	Duration/ time	Description
Functional training				
Hurdle crossing	4 rounds of 6 hurdle/session 6 days a week	2 kg weight cuffs 6 hurdles	Within 20 min time for FT	Forward and sideways crossing of hurdles with a height of 1 foot
Stair climbing	1 sets/ session 5 times a day	2 kg weight cuffs ~100 (50+50) stairs		For promoting hip and knee flexion
Bird dog exercise	2 sets/ session 5 days a week	1 kg weight cuff 12 reps with 5 sec hold time	5 minutes	For the core strengthening
Pushups against the wall	2 sets/ session 5 times a week	12 reps		For strengthening of shoulder, chest, back musculature
Ball toss with therapist	2 sets/ session 5 times a week	12 reps		
Jumping jacks	2 sets/session 5 times a week	12 reps		
Step up and step down on stairs	2 sets/session 5 times a week	12 reps		
Stepping over 19" foam pad	3 sets/session 5 times a week	20 reps.		
Marching on plane	2 sets/session 5 times a week		2 minutes for each set	
Jumping the hurdle of 4"	2 sets/session 5 times a week	20 reps		
Hanging on ladder	3 sets/session 5 times a week		For the duration of 1 minutes for each set	
Squats	3 sets/session 5 times a week	20 reps		
Balance training				
One leg standing	2 sets/ session 5 times a day	10 reps	30 sec holds with eye open; 5 sec with eye closed	To improve stability and reducing falling risk
Toe and heel raise	2 sets/ session 5 times a day	15 reps		
Marching on plane	2 sets/ session 5 times a day	15 reps		
Mild perturbations (backward, forward, sideways) in standing position	2 sets/ session 5 times a day	15 reps		
Coordination training				
Drawing a circle	2 sets/ session 5 times a day	15 reps		
Touch therapist finger with toe	2 sets/ session 5 times a day	15 reps		
Heel on shin	2 sets/ session 5 times a day	15 reps		
Alternate heel to knee and heel to toe	2 sets/ session 5 times a day	15 reps		

[Table/Fig-7]: Home based rehabilitation protocol for Schmorl's node.

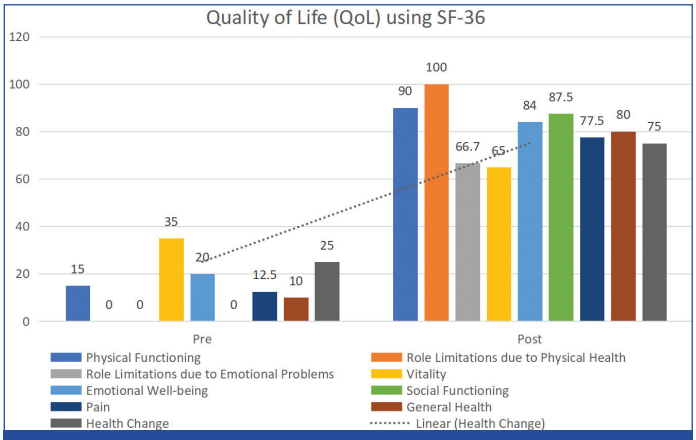
[Table/Fig-8]: Therapist mobilising the lumbar spine- PA glide over L-3 transverse process.



[Table/Fig-9]: Shows pain and discomfort reduced drastically from severe to no pain.



[Table/Fig-10]: Shows disability reduced drastically from severe to mild.



[Table/Fig-11]: Shows QoL improved in various domains.

The medical management typically involves oral NSAIDs, Tumour Necrosis Factor-alpha (TNF-α) inhibitors, Infliximab etc., [18]. Some studies shows that use of surgical intervention can be recommended, such as vertebral fusion surgery [14], fluoronavigation-assisted, percutaneous vertebroplasty [19].

Physiotherapy management focusses on alleviating pain, improving mobility, and enhancing the strength of supportive muscles around the spine. The use of ice therapy or heat can be used to reduce inflammation and pain, along with manual therapies like myofascial release and mobilisation techniques to improve spinal mobility and reduce stiffness [10].

The incidence of LBP due to Schmorl's nodes is not common in young aged adults with males affected more than females. However, we must know about the signs, symptoms, and management of this condition [20,21]. In this case study, the patient presented with LBP and a diagnosis of Schmorl's nodes. Following seven weeks of phased physiotherapy and four weeks of home based functional-rehabilitation the patient returned to his normal life.

All the domains which were targeted in rehabilitation improved except a few domains of QoL (SF-36) which may take some more weeks to improve. There was lack of literature which showed dedicated rehabilitation programme following Schmorl's node. Our study like Swain and Evans, 2014, focused on skilled and functional rehabilitation [10]. Unlike rehabilitation for an athlete carried out in USA, we demonstrated the functional approach on a sedentary individual. In India, use of physiotherapy in this condition is very limited. The effectiveness of a comprehensive OPD based and home-based programme is not well established.

There was improvement of patient symptoms, however QoL was relatively unaffected. This is in accordance with a case study mentioned earlier which was conducted in USA on a 41-year-old male presenting with LBA due to lumbar Schmorl's node. The patient was advised to continue oral medications with orthotic brace for lumbar support, pain management with epidural steroid injections and follow-up with physiotherapy. Telephonic follow-up revealed alleviation of approximately 85% of his symptoms after one month of PT [21]. Another case report with three traumatic Schmorl's nodes identifies physiotherapy and pain management as conservative treatment methods for symptomatic giant cystic Schmorl's nodes. Stability of patients with residual back pain at the end of approximately 9 to 24 months indicated that nonoperative management may be continued for patients with this vertebral pathology having low functional demands as the primary modality of management [22].

In contrast to this, a few studies done on athletes and female gymnasts with symptomatic Schmorl's nodes revealed that conservative management including pain management like invasive procedures and physiotherapy did not prove to be effective as a long-term treatment option with the athletes' career coming to an end or their sports performance deteriorating. Surgical procedures like percutaneous vertebroplasty, decompression and fusion, percutaneous balloon kyphoplasty along with rami communications nerve block injecting 2 mL of 1% mepivacaine and 10 mg of triamcinolone at grey ramus communications on each side, as well as TNF-α blockade infusion proved to be more effective in providing symptomatic relief to patients [23-26].

Moreover, it was found during the extensive literature search that no set physiotherapy protocol has been designed to counter the challenging symptomatic expressions in patients with Schmorl's nodes. Scrutiny of various articles also brought to light certain articles which talked about physiotherapy being effective in patients with LBA associated with this pathology but did not provide the set of exercises as well as dosage for exercises administered to the patients. Paucity of literature on physiotherapy protocols for symptomatic Schmorl's nodes provides novelty to this case report.

While this case report provides encouraging results, future researches could incorporate a controlled trial with larger sample size to further establish the efficacy of this protocol in managing symptomatic Schmorl's nodes. Additionally, a more detailed analysis of the SF-36 subscales would provide a more comprehensive understanding of the intervention's impact on QoL. Future studies should also investigate the long-term effects of this treatment approach. There is need to determine the best physiotherapy treatment and optimal home exercise programme for such individuals with Schmorl's nodes. Cohort studies can also be designed to establish the physiotherapy guidelines for such disabling painful condition.

CONCLUSION(S)

This case report suggests that a combined physiotherapy and home exercise programme can effectively manage LBP associated with a lumbar Schmorl's node. The Improvement seen in overall QoL of patient makes it an efficient treatment option. However, further research with larger sample sizes and controlled trials is needed to confirm these findings and establish generalisable conclusions.

REFERENCES

[1] Radhakrishnan M, Nagaraja SB. Modified Kuppuswamy socioeconomic scale 2023: Stratification and updates. Int J Community Med Public Health. 2023;10(11):4415-18. Available from: https://www.ijcmph.com/index.php/ijcmph/article/view/11606.

[2] Conroy VM, Murray BN, Alexopulos QT, McCreary J. Kendall's Muscles. Lippincott Williams & Wilkins; 2022.

[3] Camino GO, Piuzzi NS. Straight leg raise test [Internet]. Nih.gov. StatPearls Publishing; 2019. Available from: https://www.ncbi.nlm.nih.gov/books/NBK539717/.

[4] Walker HK. Deep Tendon Reflexes. In: Walker HK, Hall WD, Hurst JW, editors. Clinical Methods: The History, Physical, and Laboratory Examinations. Chapter 72. 3rd ed. Boston: Butterworths; 1990. PMID: 21250237.

[5] Fairbank JCT, Pynsent PB. The Oswestry Disability Index. Spine. 2000;25(22):2940-53.

[6] Rand Corporation. 36-Item short form survey instrument (SF-36) [Internet]. Rand.org. 2019. Available from: https://www.rand.org/health-care/surveys_tools/mos/36-item-short-form/survey-instrument.html.

[7] Rajfur J, Pasternok M, Rajfur K, Walewicz K, Fras B, Bolach B, et al. Efficacy of selected electrical therapies on chronic low back pain: A comparative clinical pilot study. Med Sci Monit. 2017;23:85-100. doi: 10.12659/msm.899461.

[8] George SZ, Fritz JM, Silfies SP, Schneider MJ, Beneciuk JM, Lentz TA, et al. Interventions for the management of acute and chronic low back pain: Revision 2021. J Orthop Sports Phys Ther. 2021;51(11):CPG1-CPG60. Doi: 10.2519/jospt.2021.0304.

[9] Franke H, Fryer G, Ostelo RW, Kamper SJ. Muscle energy technique for non-specific low-back pain. Cochrane Database Syst Rev. 2015;2015(2):CD009852.

[10] Chen Q, Wang Z, Chen X, Du J, Zhang S. Efficacy of neuromobilization in the treatment of low back pain: Systematic review and meta-analysis. PLoS One. 2024;19(5):e0302930. Doi: 10.1371/journal.pone.0302930.

[11] Evans C. The effectiveness of a home exercise program for a young athlete with Schmorl's nodes: A case report. Global J Med Clin Case Reports. 2014;013-20.

[12] Quentin C, Bagheri R, Ugbolue UC, Coudeyre E, Pélissier C, Descatha A, et al. Effect of home exercise training in patients with nonspecific low-back pain: A systematic review and meta-analysis. Int J Environ Res Pub Health. 2021;18(16):8430.

[13] Mattei TA, Rehman AA. Schmorl's nodes: Current pathophysiological, diagnostic, and therapeutic paradigms. Neurosurg Rev. 2013;37(1):39-46.

[14] Kyere KA, Than KD, Wang AC, Rahman SU, Valdivia-Valdivia JM, La Marca F, et al. Schmorl's nodes. Eur Spine J. 2012;21(11):2115-21. Doi: 10.1007/s00586-012-2325-9.

[15] Dar G, Masharawi Y, Peleg S, Steinberg N, May H, Medlej B, et al. Schmorl's nodes distribution in the human spine and its possible etiology. Eur Spine J. 2009;19(4):670-75.

[16] Kuisma M, Karppinen J, Niinimäki J, Ojala R, Haapea M, Heliövaara M, et al. Modic changes in endplates of lumbar vertebral bodies. Spine. 2007;32(10):1116-22.

[17] Hershkovich O, Koch JEJ, Grevitt MP. Schmorl node- a cause of acute thoracic pain: A case report and pathophysiological mechanism. Int J Spine Surg. 2020;14(3):441-46.

[18] Sakellariou GT, Chatzigiannis I, Tsitouridis I. Infliximab infusions for persistent back pain in two patients with Schmorl's nodes. Rheumatology (Oxford). 2005;44(12):1588-90. Doi: 10.1093/rheumatology/kei155.

[19] Wenger M, Markwalder TM. Fluoronavigation-assisted, lumbar vertebroplasty for a painful Schmorl node. J Clin Neurosci. 2009;16(9):1250-51.

[20] Sadiq IM. Lumbar spine Schmorl's nodes; prevalence in adults with back pain, and their relation to vertebral endplate degeneration. Egypt J Radiol Nucl Med. 2019;50(1):65.

[21] Pietrok A, Lee C, Kaye RJ, Kaye AD, Chesteen G. Schmorl's node: An uncommon case of back pain and radiculopathy. Orthop Rev. 2022;14(2):33641.

[22] Dimar JR 2nd, Nathan ST, Glassman SD. The spectrum of traumatic Schmorl's nodes: Identification and treatment options in 3 patients. Am J Orthop (Belle Mead NJ). 2012;41(9):427-31.

[23] Zhi-Yong S, Huan Z, Feng L, Lv Nan-Ning, Xiao-Yu Z, Bin P, et al. A retrospective study of percutaneous balloon kyphoplasty for the treatment of symptomatic schmorl's nodes: 5-year results. Med Sci Monitor. 2017;23:2879-89.

[24] Cai K, Jiang G, Lu B, Zhang K, Luo K. Bone cement distribution may significantly affect the efficacy of percutaneous vertebroplasty in treating symptomatic Schmorl's nodes. BMC Musculoskelet Disord. 2023;24(1):473.

[25] Neves NS, Ribeiro da Silva M, Cacho Rodrigues P, Silva ML, Matos R, Pinto R. Symptomatic giant Schmorl's node treated by a decompression procedure. Orthop Traumatol Surg Res. 2013;99(3):371-74. Doi: 10.1016/j.otsr.2013.01.004.

[26] Katz DA, Scerpella TA. Anterior and middle column thoracolumbar spine injuries in young female gymnasts. Am J Sports Med. 2003;31(4):611-16.

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