

# Knee Spine Syndrome: Common Clinical Correlation and Its Management Algorithm

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## ABSTRACT

**Introduction:** Various studies have been carried out proposing the concept of knee spine syndrome measuring simultaneous changes in knee flexion and sacral inclination, but none regarding its management. Here in this study, we put forward the management and diagnostic algorithm for the knee and spine disease operated by the same surgeon.

**Materials and methods:** This is a prospective study of 10 patients having knee spine syndrome operated by the same surgeon from January 2016 to January 2018. They were selected and treated as per the treatment protocol put forward and clino-radiological outcomes were evaluated with visual analog scale (VAS), Oswestry disability index (ODI) scoring, and radiographs.

**Results:** Age of the patients included in this study ranged from 55–80 years. In 6 patients, the spine was operated first and in others, knee replacement was done as an index procedure. Average pre-operative ODI score was 28.9 which decreased to 7.5 postoperatively at 2-year follow-up. VAS score decreased from 7.4 preoperatively to 1.5.

**Conclusion:** Knee spine syndrome is one of those entities which need to be identified and treated as a whole and not as two different symptomatic diseases. According to our proposed algorithm, radicular symptoms (spinal pathology) should be treated first. In cases of predominant back pain which could be either due to loss of lumbar lordosis or precipitated by deformity caused by malalignment in osteoarthritis knee, knee replacement was considered first. Despite the proposed algorithm, the clinical acumen of the surgeon in determining the leading cause of morbidity may help prevent unnecessary further staged surgeries.

**Keywords:** Degenerative spine disease, Knee spine syndrome, Lumbar lordosis, Total knee replacement.

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## INTRODUCTION

In our day to day clinical practice, we come across ample amount of cases having both knee and spine diseases

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which always pose a diagnostic and management dilemma about which disease to treat first, knee or spine!

Osteoarthritis (OA) knee is one of the major cause of morbidity all over the world. Because of its progressive nature, most of the patients eventually require operative treatment due to the development of disabling knee deformities, severe pain or stress fractures.<sup>1,2</sup> Similarly, spondylosis of lumbar segments is also a widely prevalent disease as it is exposed to the highest mechanical stress. It includes all degenerative conditions affecting the discs, vertebral bodies, and associated joints of the lumbar vertebrae like spinal stenosis, spondylolisthesis, and prolapsed intervertebral disc. In its progressive stages, it also limits the activities of patients due to severe neurogenic claudication and back pain.<sup>3-10</sup>

Severe osteoarthritis knee often causes knee flexion contracture, which limits the patient's activity of daily living leading to overloading of other joints and spine. Murata et al. hence proposed the concept of "knee spine syndrome" which stated that the degenerative changes of the knee cause degenerative changes of the spine. He postulated that a flexion contracture of more than 5° at knee causes loss of lumbar lordosis.<sup>11</sup>

Various studies have been carried out proposing the concept of knee spine syndrome, measuring simultaneous changes in knee flexion and sacral inclination, but none regarding its management. Here in this study, we put forward the management and diagnostic algorithm for the knee and spine diseases operated by the same surgeon.

The aim of the study is proper assessment and classification of patients with knee spine syndrome and to formulate a management algorithm of such patients.

## MATERIALS AND METHODS

This is a prospective study of 10 patients having knee spine syndrome operated by the same surgeon between January 2016 to January 2018 followed up for 2 years. They were selected and treated as per the treatment protocol put forward. The patient selection criteria are as under.

### Inclusion Criteria

- Age greater than 40 years
- Osteoarthritis knee grade 3 or 4 (Kellgren and Lawrence criteria) 2
- Lumbar lordosis of  $\leq 40^\circ$

- Normal hip joint
- Failure of conservative treatment

**Exclusion Criteria**

- Previous knee joint or spine surgery.
- History of trauma, infection or presence of pathology of knee other than osteoarthritis (OA) knee
- History of trauma, infection or presence of pathology of spine other than degenerative disease.

Each patient went through proper history taking, clinical examination from head to toe with special documentation of knee and spine examination and deformity of knee and spine duly noted if present. A thorough assessment of the patient’s gait and diagnostic knee injections were used if required for precise diagnosis. Radiographs of knee and lumbar (LS spine) AP and lateral dynamic views and magnetic resonance imaging (MRI) of the lumbar spine were done. The clinical post-operative outcome was documented with VAS score and ODI score for knee and spine symptoms respectively.

All the patients of knee replacement were operated with metal back implants using a medial parapatellar retinaculum approach. Bilateral knee replacements were performed in alternate sitting with a gap of 1–2 days between each surgery. In the spine, titanium pedicle screws were used for instrumentation along with the polyetheretherketone (PEEK) cage if required.

**Kellgren Lawrence Classification of Osteoarthritis Knee<sup>12</sup>**

- *Grade 0:* No radiographic features of OA are present
- *Grade 1:* Doubtful joint space narrowing (JSN) and

- possible osteophytic lipping
- *Grade 2:* Definite osteophytes and possible JSN on anteroposterior weight-bearing X-ray
- *Grade 3:* Multiple osteophytes, definite JSN, sclerosis, possible bony deformity
- *Grade 4:* Large osteophytes, marked JSN, severe sclerosis and definite bony deformity

**RESULTS**

Age of the patients included in this study ranged from 55–80 years, average being 66.3 years. 8 of them were females, and 2 were males. In 6 patients, the spine was operated first and in others, knee replacement was done as an index procedure. Average pre-operative ODI score was 28.9 which decreased to 7.5 postoperatively at 1-year follow-up. VAS score decreased from 7.4 preoperatively to 1.5. Specific diagnosis of the patients was made after proper clinical examination and radiographic investigations which is shown in Table 1.

Each patient was managed as per the algorithm pre-set, and the staged operative procedures were carried out as shown in Table 2. The changes in VAS and ODI<sup>13</sup> scores are shown in Table 3.

The following are the radiological images of patient 6 (Fig. 1). The staged procedures were done as per our algorithm as described in Flow Chart 1.

**DISCUSSION**

Tsuiji et al. postulated the correlation between the sacral inclination and the patellofemoral joint pain.<sup>14</sup> They stated that sacral inclination was lesser in patients with flexion defect and thereby defined the knee spine syndrome.

**Table 1:** Diagnosis of each patient with knee and spine disease

Patient (age in years)	Knee disease diagnosis			Spine disease diagnosis
	OA grade	FFD (Degree)	Varus (Degree)	
Pt 1 (67)	Grade 4	5	10	L3–4, l4–5 severe LCS with normal neurology
Pt2(71)	Grade 4, medial condyle stress fracture	15	20	L4–L5 lysis with L3–L5 moderate LCS with normal neurology
Pt3 (65)	Grade 4	5	5	L2–3, L3–4, L4–5 LCS with normal neurology
Pt4 (60)	Grade 3	10	5	L4–5 grade 2 listhesis with normal neurology
Pt5 (55)	Grade 3	5	10	L4-5, L5–S1 PID with normal neurology
Pt6 (69)	Grade 4	10	–	L3–4, L4–5 SEVERE LCS with L4–5 degenerative listhesis with normal neurology
Pt7 (73)	Grade 3	10	20	L3–4, L4–5 mild LCS with normal neurology
Pt8 (64)	Grade 4 (R >L)	5	5	L4–5, L5–S1 LCS with Modic changes with normal neurology
Pt9 (80)	Grade 4	10	15	L3–4, L4–5, L5–S1 LCS with kyphotic deformity with normal neurology
Pt10 (59)	Grade 3	8	–	L4–L5 PID with normal neurology

FFD: Fixed flexion deformity, LCS: lumbar canal stenosis, PID: Prolapsed intervertebral disc

**Table 2:** Operative procedures underwent by each patient

Patient	First procedure	2nd stage procedure
Pt1	L3–L5 Laminectomy+ PLF	B/L TKR after 5 months
Pt2	B/L TKR	Spine managed conservatively
Pt3	B/L TKR	Spine managed conservatively with epidural injection
Pt4	L4-5 TLIF	B/L TKR after 3 months
Pt5	L4–5, L5–S1 discectomy	B/L TKR after 2 months
Pt6	L3-L5 Laminectomy +fixation + PLF	B/L TKR after 3 months
Pt7	B/L TKR	Spine managed conservatively with epidural injection
Pt8	Rt TKR	L4-S1 Laminectomy +fixation + PLF after 2 months
Pt9	D11–L5 fixation + Ponte's corrective osteotomy	Pt expired after 3 months
Pt10	L4–5 discectomy	B/L TKR after 2 months

PLF: Posterolateral fusion TKR: Total knee replacement TLIF: Transforaminallumbrinterspinal body fusion

**Table 3:** Clinical outcome based on VAS and ODI scoring

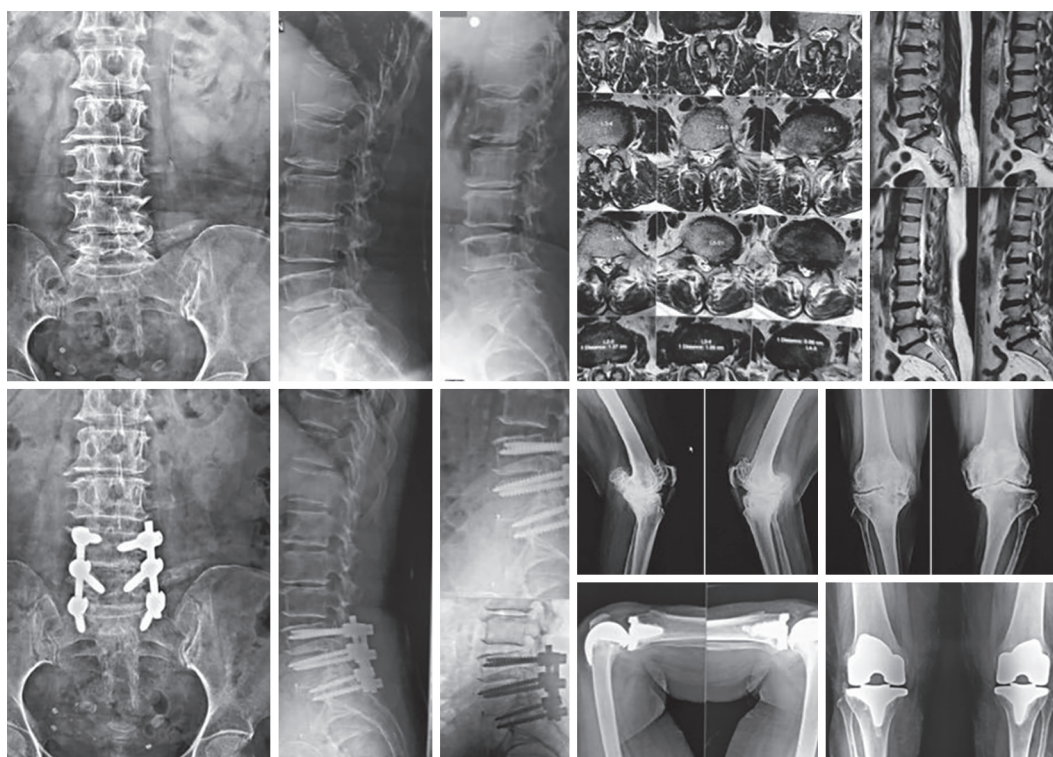
Patient	Preoperative score		Postoperative Score	
	ODI	VAS	ODI <sup>13</sup>	VAS
Pt 1	28	7	7	2
Pt2	20	9	12	3
Pt3	24	8	10	2
Pt4	32	6	5	1
Pt5	35	7	6	1
Pt6	30	8	8	2
Pt7	21	6	8	1
Pt8	30	8	6	1
Pt9	38	8	–	–
Pt10	31	7	6	1
Average	28.9 (64.2%)	7.4	7.5(16.6%)	1.5

ODI score interpretation (13): 0–20%–Minimal disability; 21–40%–Moderate Disability; 41–60%–Severe disability; 61–80%–Crippled; 81–100%–Bed ridden

The sacral inclination was 5 degrees lesser in those with limited flexion. However, there is no mention regarding the line of management for the same.

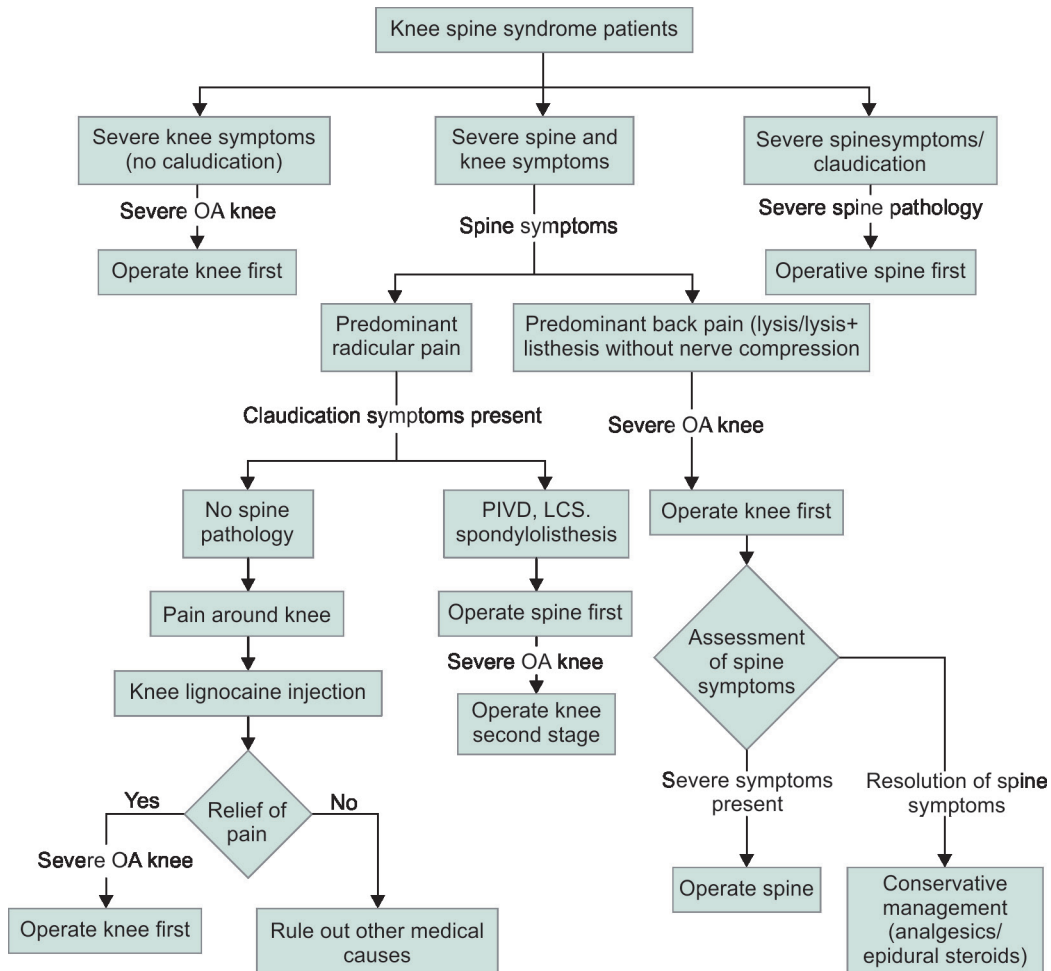
Knee spine syndrome was postulated by Murata et al.<sup>11</sup> He stated that degenerative changes in the knee cause loss of lumbar lordosis. The lumbar lordosis was significantly reduced in those patients which had a limitation of knee extension by more than 5 degrees. This is how they described the knee spine syndrome; again, nothing was stated regarding its management.

Knee spine syndrome is one such disease which needs to be properly identified and differentiated from isolated knee and spine diseases. A lot of clinicians consider one of the disease as a referred symptom of the other. It becomes very important to thoroughly examine the patient with proper neurological assessment followed by radiological investigations. A proper history taking and examination are most crucial in such patients to know which symptom was more debilitating and hampering the daily activity, following which X-ray and MRI were done to match our clinical correlation. Further management was based upon



**Fig. 1:** Pre- and post-op radiological images of patient 6

Flow Chart 1: Management algorithm for knee spine syndrome patients



the predominance of presenting symptom. The patients having severe knee and spine symptoms pose a dilemma for further management, so in such cases if spine symptoms were radicular pain with severe claudication (PIVD, lumbar canal stenosis or spondylolisthesis), spine is to be operated first, and if only back pain tends to be a chief complaint due to spinal pathology, total knee replacement was done in the first stage. The concept behind it is that removal of compressive pathology is necessary for relief of radiculopathy and claudication, whereas knee alignment and deformity corrected by knee replacement can further aid in improving spine load bearing biomechanics leading to possible amelioration of back pain symptoms. After knee replacement, they were reassessed for spine symptoms again after 1 month. Those with resolving symptoms were managed conservatively with either analgesics or epidural steroids. But those with persistent severe complain of back pain were operated for respective spinal pathology.

Thus we have formulated the following management algorithm shown in Flow Chart 1.

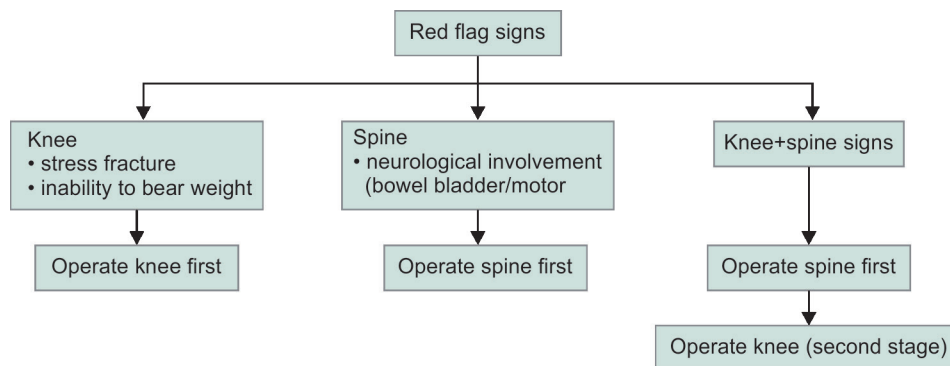
As evident from the clinical outcome scoring, all the patients had satisfactory relief in both knee spine

symptoms after surgery. All the patients with severe osteoarthritis knee ultimately underwent knee replacement surgery, while 3 patients with spinal pathology were managed conservatively after knee replacement and still had an acceptable quality of life. This indicates that the natural history of spinal degenerative diseases is more favorable and can lead to a positive outcome if precipitating factor is curbed, which in these cases was altered load bearing biomechanics due to deformity in the knee.

There are a few red flag signs for both knee and spine pathologies which if present necessitates urgent intervention in order to achieve expected recovery and avoid grave complications in Flow Chart 2.

This algorithm regarding the management of knee spine syndrome is amongst the first that is postulated. Moreover, it is noteworthy that both spine and knee surgeries were done by the same surgeon. The patients in the study had a good clinical outcome postoperatively after the two operations, and a few did not need the second surgery since the symptoms subsided. Hence the correct management of these patients helps in curbing unnecessary surgical intervention with proper management of patient's symptoms. One of the limitations of our study is a small number of subjects.

Flow Chart 2: The red flag signs



## CONCLUSION

Knee spine syndrome is one of those entities which needs to be identified and treated as a whole and not as two different symptomatic diseases. Quite a few studies in the past have defined the knee spine syndrome, but nothing has been said about its management. Hence we conclude that in a patient having the overlapping symptom of knee and spine pathology, radicular symptoms should be treated first. In the cases where back pain was a prominent feature due to loss of lumbar lordosis precipitated by deformity and malalignment of osteoarthritis knee, knee replacement was considered first. Despite the proposed algorithm, the clinical acumen of the surgeon in determining the leading cause of morbidity may help prevent unnecessary further staged surgeries.

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