Clinical ability of contrast-enhanced MRI to predict treatment outcomes for lumbar facet joint pain

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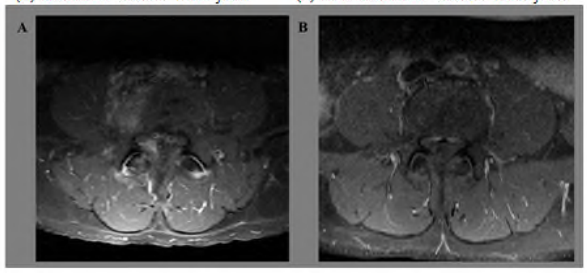
Objective

- Several radiologic imaging techniques have been used to predict the effects of treatment on lumbar facet joint (LFJ) pain.
- However, there are no reports on the use of contrast-enhanced magnetic resonance imaging (MRI) in the management of LFJ pain.
- In the current study, we aimed to evaluate the clinical ability of contrast-enhanced MRI using gadolinium to predict treatment outcomes for LFJ pain.

Methods

- Subjects
  - Inclusion criteria
    - Age : 21-79 years
    - Lumbar axial pain persisting for more than six months without radicular symptoms
    - Numerical rating scale (NRS) > 3
    - A minimum of 80% temporary pain improvement for a minimum of 30 minutes after a selective diagnostic block to each LFJ pain location
    - Local paraspinal tenderness with increased pain during rotation, lateral bending and hyperextension
    - Lower lumbar spine pain that increased during rotation, lateral bending, and hyperextension; and local paraspinal tenderness.
    - Patients who had been treated with contrast-enhanced lumbar spine MRI using gadolinium that showed spondyloarthropathy.
  - Exclusion criteria
    - Allergy to contrast materials, spinal instability, disc herniation, lumbar spinal stenosis, coagulopathy, any uncontrolled psychiatric or medical condition, and rheumatic diseases.
- Two radiologists independently investigated LFJ enhancement and osteoarthritis grading.
  - Patients were classified into enhanced and non-enhanced groups, based on contrast-enhanced MRI scans using gadolinium (Fig. 1).

Figure 1. Enhancement and non-enhancement of the lumbar facet joint in axial contrast-enhanced T1 magnetic resonance imaging.
(A) Enhanced lumbar facet joint (B) Non-enhanced lumbar facet joint



- Grading criteria for osteoarthritis(OA) of the facet joint
  - 0 : normal facet joint space (2-4 mm width)
  - 1 : narrowing of the facet joint space (< 2 mm), and/or presence of small osteophytes, and/or mild hypertrophy of the articular process
  - 2 : narrowing of the facet joint space, and/or presence of moderate osteophytes, and/or moderate hypertrophy of the articular process, and/or mild subarticular bone erosions
  - 3 : narrowing of the facet joint space, and/or presence of large osteophytes, and/or severe hypertrophy of the articular process, and/or severe subarticular bone erosions, and/or subchondral cysts
- IA corticosteroid injection procedure was administered using C-arm fluoroscopic guidance (Siemens, Erlangen, Germany).
  - 10 mg (0.25 mL) of dexamethasone with 0.5 mL of 0.25% bupivacaine
- Clinical outcomes using NRS score
  - Before treatment, 1, 2, and 3 months after treatment
- Statistical analysis: p value < 0.05

Table 1 Demographic and clinical data of the patients

Variable	Enhanced group	Non-enhanced group	p-value
Sex (male/female)	9/7	5/5	1
Mean age (years)	68.88±9.24	59.30±11.60	0.035*
Duration until treatment from pain onset (months)	29.25±28.19	33.30±46.22	0.689
Facet degeneration grade (grade 1/2/3)	4/7/5	3/5/2	0.886

Values are shown as number or mean±standard deviation. *p<0.05.

Facet degeneration grades are graded by criteria for grading osteoarthritis of the lumbar facet joints on T2-weighted imaging.

- Clinical outcomes (Table 2, Fig. 2)
  - In both the enhanced and non-enhanced groups, NRS scores significantly decreased at 1, 2, and 3 months after treatment (p < 0.05).
  - However, we saw no significant difference between the groups from pretreatment to three months after treatment (p > 0.05).

Table 2 Changes in numerical rating scale scores from pretreatment to 3 months after treatment

	Enhanced group	Non-enhanced group	p-value (group comparison)
NRS			0.746
Pretreatment	4.36±0.81	4.60±1.26	
After 1 month of treatment	2.50±1.26	2.10±1.52	
After 2 months of treatment	2.38±1.36	2.00±1.76	
After 3 months of treatment	2.38±1.41	2.30±1.83	
Time effect	<0.001*	<0.001*	

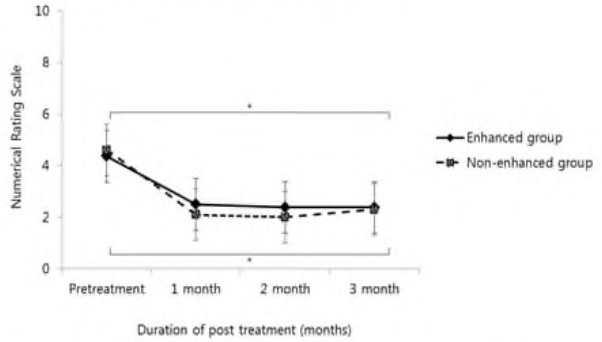
Values are shown as number or mean±standard deviation. *p<0.05.

NRS: numerical rating scale, time effect: temporal changes of NRS scores in each group after treatment.

Result

- A total of 26 patients (12 women and 14 men; mean age: 65.19±11.05 years) with LFJ pain were recruited.
- Demographic and clinical data of the patients
  - Among the 26 patients, 16 patients were included in the enhanced group, and the remaining 10 patients were included in the non-enhanced group, based on contrast-enhanced MRI scans using gadolinium (Table 1).

Fig 2: Comparative results of numerical rating scale of lumbar facet joint pain in enhanced and non-enhanced groups. *p<0.05



- There was 100% agreement between the two radiologists about the enhancement and grading for osteoarthritis of the LFJs. In addition, the Cohen's kappa score for the agreement of two radiologists was 1.00.
- No serious complications or adverse events were reported.

Conclusion

- We evaluated the clinical ability of contrast-enhanced MRI using gadolinium to predict treatment outcomes for LFJ pain.
- This study is the first trial evaluating the correlation between contrast-enhanced MRIs using gadolinium and treatment outcomes for LFJ IA steroid injections.
- Our study found no correlation between contrast-enhanced MRI findings and LFJ steroid injections.
- The routine use of contrast-enhanced MRI using gadolinium is not recommended in patients with LFJ pain.