

The Lumbosacral Lucent Cleft

I Y Y Tsou, T S G Chee, R H Y Tan

ABSTRACT

Background: The lumbosacral lucent cleft was first described in association with traumatic injuries to the neck. However, we have observed this sign to be present in patients with no precursor of trauma, and we reviewed the incidence of lucent cleft sign in our local population and any characteristic features of the lucent cleft.

Methods: Four-hundred and thirty lumbosacral spine radiographs were examined prospectively over an 8-month period, with correlation with clinical findings. Follow-up radiographs were obtained at 1, 3 and 6 months for patients with the lucent cleft sign.

Findings: Nineteen patients (4.4%) were found to have lucent clefts in their lumbosacral spine X-rays. No significant change in the number and features of the lucent clefts was noted even when the symptoms had resolved after 6 months. All the lucent clefts were linear, horizontally oriented and located at the anterior edge of the adjacent vertebral body.

Conclusion: The lucent cleft sign in the spine, which has so far been described in association with spinal trauma may be completely innocuous in patients with little or no symptoms.

Keywords: lucent cleft sign, lumbosacral spine, vacuum phenomenon

INTRODUCTION

Air within the spinal disc spaces appears on plain radiographs as a lucent cleft sign. This was first described by Raymond et al⁽¹⁾ as a sign of soft tissue injury following neck trauma. Although it is reportedly also associated with degeneration, infection and vertebral collapse, it can also be a completely innocuous finding, with no other evidence of spinal injury or disease. The aims of this study are twofold: to determine the prevalence of the clinically insignificant lucent cleft in our local population, and to describe the characteristic features of the clinically insignificant lucent cleft.

METHODS

A prospective radiological study of the lumbosacral spine with correlation to clinical findings was done for 430 patients presenting between June 1993 and January 1994. Among these, 401 had mild non-specific lower backache which was the indication for the X-

ray investigation, while the other 29 patients did not have any symptoms referable to the spine. These radiographs were done as part of their vocational assessment.

The age range of the patients was from 18 to 45 years with a mean of 24.9 years. Among the 19 patients with lucent clefts, the age ranged from 21 to 43 years with the mean at 32.6 years. All were males with the exception of 1 female, and the ethnic distribution was 16 Chinese and 3 Indians. Their vocations/occupations were also noted, with 14 having sedentary jobs and 5 who did strenuous work.

Anteroposterior and lateral views of the neutral (unextended) lumbosacral spine were done with a Siemens Polyphos machine, using a horizontal beam with the patient in an erect posture. Centering of the beam was at L3 level. The tube-film distance was maintained at 115 cm, and kV and mAs ranges were within 96 - 103 and 80 - 100 respectively.

Using the lateral view of the lumbosacral spine, the disc space was divided into three segments of equal width, and labelled anterior/middle/posterior, so as to localise the position of the lucent cleft.

Clinical follow-up and similar repeat radiographs were done at 1, 3 and 6 months from the date of the initial radiograph for the patients with lucent clefts.

RESULTS

Of the total 430 patients, 19 (4.4 %) had one or more lucent clefts within the lumbosacral spine. Out of the 401 symptomatic patients, 16 (3.9 %) had lucent clefts, while the asymptomatic group had 3 (10.3 %) patients with lucent clefts out of 29 patients. None of the

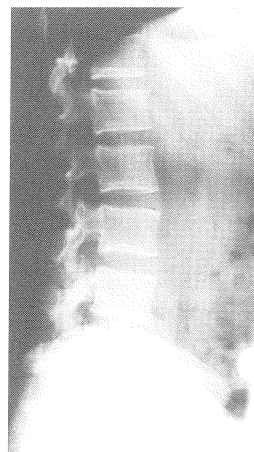


Fig 1

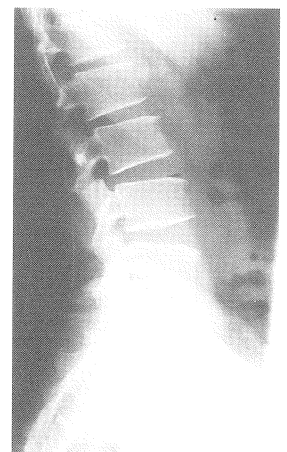


Fig 2

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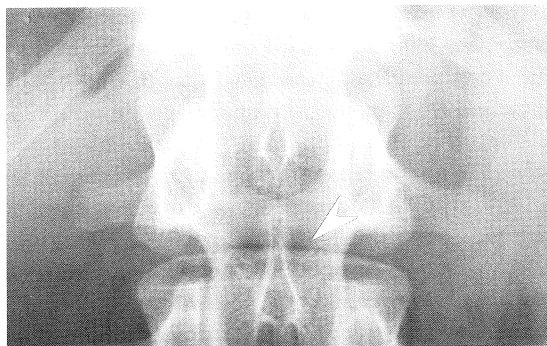


Fig 3

patients gave a history of recent severe trauma. No radiological evidence of significant degenerative disease nor loss of the disc height was also noted in this group. Twelve patients had the lucent cleft at only one level (Fig 1), while the remaining 7 had two lucent clefts (Fig 2). The lucent cleft was also demonstrated on some of the AP views taken (Fig 3; white arrowhead), but was not as consistently visualised as compared to the lateral projections.

On follow-up, 1 patient emigrated overseas after three months and was subsequently excluded from the study. No significant abnormalities were detected on clinical examination at each follow-up. Fourteen patients were still symptomatic at one month, 4 at 3 months, and the symptoms resolved by the time of the 6-month follow-up in all the patients (Table I). There was also no change in the size or appearance of the lucent clefts throughout the 6-month follow-up period.

Table I - Symptoms (backache) at follow-up

Patient	1 month	3 months	6 months
1	N	N	N
2	N	N	N
3	Y	N	N
4	Y	Y	N
5	Y	N	N
6	Y	N	N
7	Y	N	N
8	Y	N	N
9	Y	N	N
10	Y	N	N
11	Y	Y	N
12	Y	Y	N
13	Y	Y	N
14	(lost to follow-up)		
15	Y	N	N
16	Y	Y	N
17	Y	N	N
18	N	N	N
19	Y	N	N

Y - Symptoms are present
N - No symptoms present

A total of 25 lucent clefts were seen and all were linear and horizontally oriented with smooth outlines. All except one were overlying the adjacent superior end-plate, and all were eccentrically situated in the anterior one-third of the disc. The most frequent level of lucent clefts was at the L 3/4 level, and just over one-third were 5 mm in length as measured on the lateral radiograph. The details of the lengths and levels of the 25 lucent clefts observed are outlined in Tables II and III respectively.

DISCUSSION

Anatomic changes of the disc

The intervertebral disc is composed of three distinct parts, the cartilaginous end-plate covering the bone of the centrum, the semigelatinous central nucleus pulposus, and the circular annulus fibrosus limiting the nucleus on the periphery. Together with the disc, the anterior and posterior longitudinal ligaments provide the main support for the vertebral column,

Table II - Length of lucent cleft on lateral view

Length of lucent cleft (lateral view)						
	3mm	4mm	5mm	6mm	7mm	8mm
Number	2	6	9	5	1	2

Table III - Level of intervertebral disc involved

Intervertebral disc involved				
	L1-L2	L2-L3	L3-L4	L4-L5
Number	3	10	11	1

as they attach on to the bone of the centrum via Sharpey's fibres. The anatomical changes with development and age are fairly complex. Up to age 30, the gel-like nucleus gradually becomes a more fibrous viscous structure, and its mobility is reduced because of fibrous anchoring to the cartilage plate. With normal lumbar lordosis, the posterior annular fibres begins to bear more weight, resulting in weakening at the lateral posterior corners of the annulus.

Aetiology of lucent clefts

The presence of the lucent cleft in the cervical spine was first reported by Raymond et al⁽¹⁾ in 1972, and was associated with traumatic hyperextension of the neck. The hyperextension results in partial avulsion of the disc from the end-plate, resulting in a vacuum phenomenon in this potential space, which must be filled. The vapour pressure in this space is lower than the vapour pressure of gases, principally nitrogen, dissolved in the adjacent tissues as well as accumulation from within disc fissures, and it diffuses

out to fill the vacuum. An analysis of gas in the vacuum found in the lumbar disc space by Ford et al⁽²⁾ in 1977 confirms that nitrogen comprises 90% - 92%, with oxygen, carbon dioxide and other traces of gases making up the rest. The other type of vacuum phenomenon within the disc spaces was described by Magnusson⁽³⁾ in 1937, who did not attribute any clinical significance to it. It was only recognised by Knutsson⁽⁴⁾ five years later to arise from disc degeneration. This vacuum phenomenon has a different appearance in that it has ragged borders, and sometimes extends into the degenerated disc. It may not lie adjacent to the end-plate, and is often associated with other radiologic changes of degeneration, such as hypertrophic bony protrusions and disc space narrowing. Disc degeneration may also occur secondary to calcium pyrophosphate dihydrate (CPPD) deposition disease or alkaptonuria, where the deposits injure the disc directly and interferes with its nutrition.

Other less common causes of spinal vacuum phenomena described by Resnick⁽⁵⁾ include spondylosis deformans, vertebral osteomyelitis or neoplasm leading to vertebral collapse, and any causes of Schmorl nodes.

From our observations in this study, it appears that the lucent cleft sign may occur without any preceding trauma or degeneration in the age group studied, and thus the presence of the lucent cleft sign as an incidental finding on radiographs may be clinically insignificant. However, there must always be clinical correlation for any symptoms that are referable to the back.

Further evidence that the lucent cleft may not always be a result of trauma is seen in the fact that none of the clefts disappear, even after a 6-month period of follow-up, during which no episode of trauma was registered or reported. This is because resolution of the lucent cleft is taken as a sign of healing and fibrosis occurring to obliterate the space occupied by the gases.

The characteristics of the lucent clefts documented in our study all show a similarity which suggest that this may be used to identify clinically insignificant air in the disc space. They are as follows:

1. smooth outlines
2. linear, horizontally orientated.
3. measures between 3 to 8 mm in the antero-posterior plane (on lateral view)
4. eccentrically situated in anterior one-third of disc
5. extends to anterior edge of the vertebral body
6. abuts the superior end-plate of the vertebral body
7. no loss of disc height.

CONCLUSION

The presence of the lucent cleft sign in patients with no history of significant trauma is reported in this study, and the characteristics of this lucent cleft are described. There was also no demonstrable correlation between the presence of the lucent cleft and the clinical symptoms, as there was no change in the radiographic picture of the lucent cleft even after the symptoms had resolved on follow-up.

ACKNOWLEDGEMENT

We wish to acknowledge Ms Aileen Foo for her assistance in the radiography of the patients.

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