



가 X 1

CT

1,991 CT 78 CT

X

78 34 87 가 가 가

1/3 1/3 (n=49, 50.4%) 1/3

(n=36, 37%) 가

8

가 (n=51, 49.5%),

(n=7, 6.8%),

X

(n=41, 39.8%),

(n=4, 3.9%)

가

X

(posterior diaphragmatic defect)
(Computed tomography; CT)

Caskey (1) CT

X

CT

X

165 , , ,

164 , CT 36

1,991 1,991 CT 44 34

CT 78 (4%)

X CT 1

34

87 (, 61)

(diaphragmatic crus)

(retroperitoneal)

6 2,356 CT

(thin - section) CT

CT Somatom Plus 4 (Siemens Medical System, Erlangen, Germany) Sensation 16 (Siemens Medical System, Erlangen, Germany) , (Ultravist 300 , Schering Korea, Seoul, Korea) 80 - 100 mL 2 - 2.5 mL (slice interval) (overlap) 5 mm

X-ray unit D-R-CHEST, IR-800-150, New York)

(Fig. 1 - 5).

CT

X

(posterior costophrenic sulcus)

(blunting),

(focal humping),
(convexity)

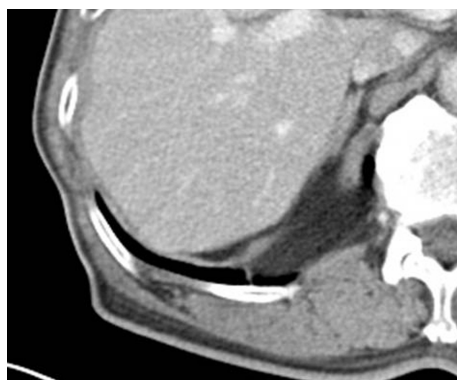
(upward

(Fig. 1 - 5).

X

1/3

1/3



A



B

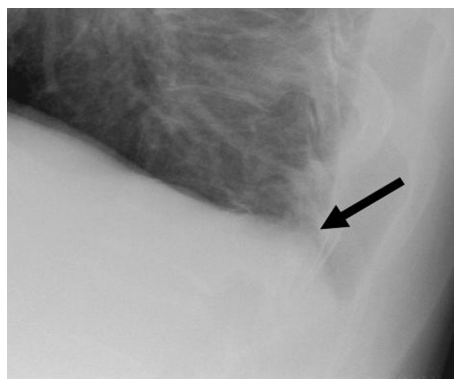
Fig. 1. Chest CT (A) and lateral radiography (B) of a 39-year-old female patient.

A. Defect in both medial and middle one third of the right posterior diaphragm

B. Normal appearance of the right posterior diaphragm and costophrenic sulcus



A

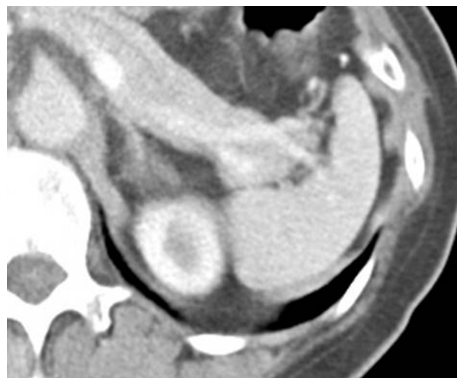


B

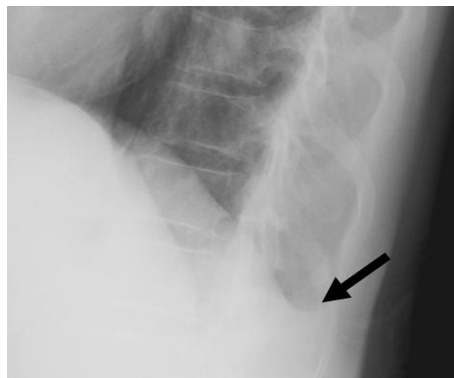
Fig. 2. Chest CT (A) and lateral radiography (B) of a 78-year-old male patient

A. Defect in medial one third of the left posterior diaphragm

B. Focal humping of the posterior diaphragm (arrow)



A



B

Fig. 3. Chest CT (A) and lateral radiography (B) of a 62-year-old female patient

A. Defect in middle one third of the left posterior diaphragm

B. Blunting of the posterior costophrenic sulcus (arrow)

X

fundus)
fissure)

(gastric
(major

가

CT

78

(minor fissure)

4%

(2). 2,356 CT

가

가

가

CT

36 , CT 165

CT 2,155 CT

가

78

103

92.3% (72/78), 39.7% (31/78) ,

가

($p < 0.05$). 25

CT

가

CT

X

(Fig. 1A, 4A)가 47.6%

CT

1/3

(49/103) 가

1/3

(Fig. 5A)

1/3

1/3

1/3

가 1 가

(Table 2).

8

CT

53

X

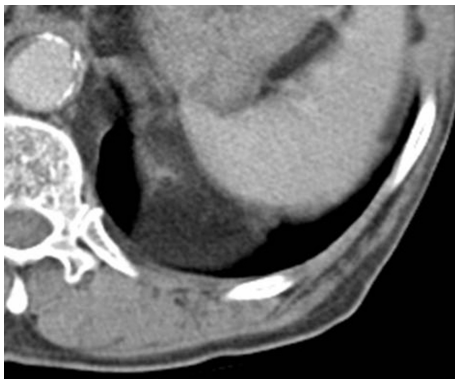
CT

103

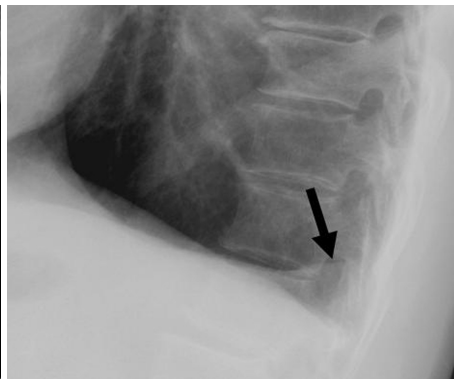
X

(Fig. 1B, 5B) 49.5%

(Chi - Square test), Fisher exact test (51/103), 50.5% (52/103)

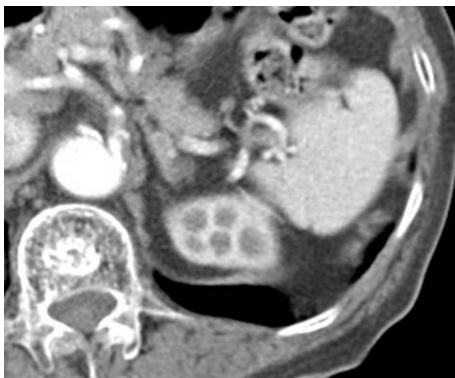


A



B

Fig. 4. Chest CT (A) and lateral radiography (B) of a 70-year-old male patient
A. Defect in both medial and middle one third of the left posterior diaphragm
B. Upward convexity of the posterior costophrenic sulcus (arrow)



A



B

Fig. 5. Chest CT (A) and lateral radiography (B) of a 83-year-old female patient

A. Defect in lateral one third of the left posterior diaphragm

B. Normal appearance of the posterior diaphragm and costophrenic sulcus

X

(Fig. 3B) 39.8% (41/103) 가 Bochdalek hernia

(Fig. 2B)가

(Fig. 4B)

가

가

6.8% (7/103),

3.9% (4/103)

1/3

92

11

1/3

1/3

X

80

11% (6/53)

(Table 1) Caskey (1)

50 (54.3%) 2 (18.2%) ,

10%

Bochdalek hernia (7)

1/3

1/3

X

30%

($p=0.028$) (Table 2).

CT

CT

Gale (3) CT 940 (diaphragmatic eventration) 가

6%

(Bochdalek hernia)

가

100

CT (8)

X

(diaphragmatic rupture) CT

Bochdalek hernia CT

(4 - 6). Caskey (1)

(radial tear) 가

(peripheral detachment)

40 , 50 , 60 , 70 25% (5/20), 45% (9/20),

55% (11/20), 60% (12/20)

, 20 30

가

MDCT

(multiplanar reformatted image) 가

(thoracoabdominal pressure)

Table 1. Frequency of Posterior Diaphragmatic Defects According to Age

	Age Group (Years) of Patients who Performed Chest CT									Total
	0 - 9	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 - 79	80 - 89	
No. of patients examined	33	37	95	154	332	503	549	235	53	1991
No. of patients with diaphragmatic defect on CT	0	0	0	3	13	22	24	10	6	78
Frequency (%) of diaphragmatic defect	0	0	0	2	4	4	4	4	11	4

Table 2. Relationship between Lateral Chest Radiographic Findings and Location of Posterior Diaphragmatic Defects

Lateral radiographic finding	Location of Posterior Diaphragmatic Defect					Total
	Medial 1/3	Middle 1/3	Lateral 1/3	Medial 1/3 and middle 1/3	Middle 1/3 and Lateral 1/3	
Normal	8	22	1	18	2	51
Blunting of posterior CPA	2	10	0	24	5	41
Focal humping of posterior diaphragm	0	2	0	5	0	7
Upward convexity of posterior CPA	0	2	0	2	0	4
Total	10	36	1	49	7	103

-- CPA; costophrenic angle

(9).

eventration),

X

가

X

(diaphragmatic

가

가

가

가

X

X

(39.8%),

(6.8%),

(3.9%)

X

Bochdalek hernia

가

가

X

가

X

가

1/3

1/3

X

1/3

X

1/3

(tangential)

가

CT

X

X

X

1. Caskey CI, Zerhouni EA, Fishman EK, Rahmouni AD. Aging of the diaphragm: a CT study. *Radiology* 1989;171:385-389
2. Juhl JH. Methods of examination, anatomy, and congenital malformations. In Juhl JH, Crummy AB. *Paul and Juhl's essentials of radiologic imaging*. 5th ed. Philadelphia: J B Lippincott, 1987;695-739
3. Gale ME. Bochdalek hernia: prevalence and CT characteristics. *Radiology* 1985;156:449-452
4. De Martini WJ, House AJ. Partial Bochdalek's herniation: computerized tomographic evaluation. *Chest* 1980;77:702-704
5. Shin MS, Mulligan SA, Baxley WA, Ho KJ. Bochdalek hernia of diaphragm in the adult diagnosis by computed tomography. *Chest* 1987;92:1098-1101
6. Curley FJ, Hubmayr RD, Raptopoulos V. Bilateral diaphragmatic densities in a 72-year-old woman. *Chest* 1984;86:915-917
7. Gravier L. Congenital diaphragmatic hernia. *South Med J* 1974;67:59-61
8. CT 1990;26:743-746
9. Iochum S, Ludig T, Walter F, Sebbag H, Grosdidier G, Blum AG. Imaging of diaphragmatic injury: a diagnostic challenge? *Radiographics* 2002;22:S103-S116

Posterior Diaphragmatic Defect Detected on Chest CT: the Incidence according to Age and the Lateral Chest Radiographic Appearances¹

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Purpose: We wanted to investigate the incidence of posterior diaphragmatic defect on chest CT in various age groups and its lateral chest radiographic appearances.

Materials and Methods: The chest CT scans of 78 patients of various ages with posterior diaphragmatic defect were selected among 1,991 patients, and they were analyzed for the incidence of defect in various age groups, the defect location and the herniated contents. Their lateral chest radiographs were analyzed for the shape of the posterior diaphragm and the posterior costophrenic sulcus.

Results: The patients' ages ranged from 34 to 87 with the tendency of a higher incidence in the older patients. The defect most frequently involved the medial two thirds ($n = 49$, 50.4%) and middle one third ($n = 36$, 37%) of the posterior diaphragm. The retroperitoneal fat was herniated into the thorax through the defect in all patients, and sometimes with the kidney ($n = 8$). Lateral chest radiography showed a normal diaphragmatic contour ($n = 51$, 49.5%), blunting of the posterior costophrenic sulcus ($n = 41$, 39.8%), focal humping of the posterior diaphragm ($n = 7$, 6.8%), or upward convexity ($n = 4$, 3.9%) of the posterior costophrenic sulcus on the affected side.

Conclusion: The posterior diaphragmatic defect discovered in asymptomatic patients who are without a history of peridiaphragmatic disease is most likely acquired, and this malady increases in incidence according to age. An abnormal contour of the posterior diaphragm or the costophrenic sulcus on a lateral chest radiograph may be a finding of posterior diaphragmatic defect.

Index words : Diaphragm, abnormalities
Diaphragm, CT
Thorax, radiography
Thorax, CT
Hernia, diaphragmatic

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