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VERTEBRAL OSTEOPOROSIS ESPECIALLY ITS ROENTGENOLOGICAL STUDY

by

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Osteoporosis is defined, according to the concept of ALBRIGHT, as decreased bone mass in which the osteoblasts are primarily deficient in laying down in osteoid tissue.

The most evident changes of osteoporosis are observed in the vertebra (SCHMORL & JUNGHANNS). As the primary sign of vertebral osteoporosis is revealed reduction of number and thickness of the spongy trabeculae, especially of the transverse ones. The trabecular texture become more transparent... ground-glass appearance... by contrast with the cortex being more thin and dense (so-called "frame vertebra"). In advanced cases, the vertebral plate is fractured and the disk protrudes into the corpora vertebrae (SCHMORL's nodule). The vertebral bodies collapse to shapes of uni- or biconcave, wedge and plate (so-called "cod-fish vertebra" with ballooned disk, cuneiform vertebra and vertebra plana). Compression fracture of the vertebral bodies may occur, and as its commonest type "concertina vertebra" had described by KIVILAAKSO.

These deformities follow dorsal kyphosis reported by KIENBÖCK, scoliosis by DROGULA, kissing spine by JESSERER and DROGULA, pseudospondylolisthesis by SCHEUER and narrowing of the foramina by STEINDER and others.

In spite of recent advances in the research of osteoporosis in America and Europe, little attention has been paid on the problem in Japan. This investigation is for the purpose to observe the incidence of vertebral osteoporosis in Japanese, and to classify the roentgenographic changes of the osteoporotic vertebra.

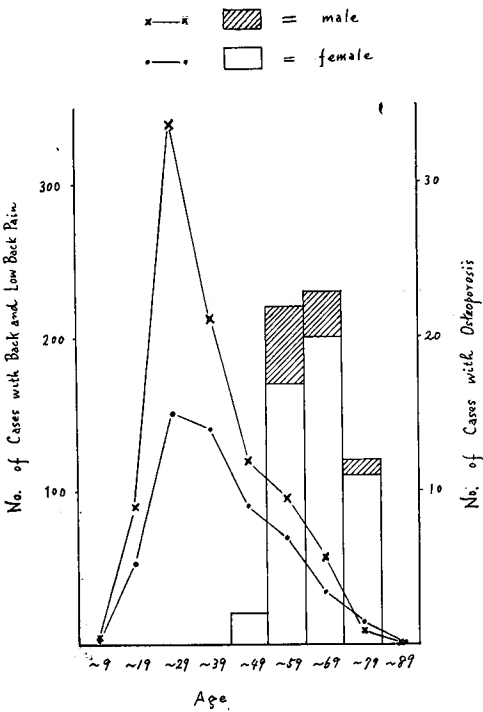
INCIDENCE

Of 1489 patients with back and low back pain from our clinic (Table 1), vertebral osteoporosis is observed radiologically in 59 cases, 50 female and 9 male, all of cases are aged 40 years or more (average age 60.8). (Fig. 1)

Table 1 Patient with Back and Low Back Pain (Jan. 1959—Mar. 1960)

age	~ 9	~19	~29	~39	~49	~59	~69	~79	~89	
male	5	91	339	214	120	95	57	9	1	931
female	3	52	150	141	91	70	35	15	1	558
total	8	143	489	355	211	164	92	24	2	1489

Fig. 1 Age Distribution of Cases



The incidence of osteoporosis is 4 per cent, and even of all patients over 40 years, osteoporotic vertebra found in approximately 12 per cent. (male in 3 per cent, female in 24 per cent).

In comparison with the statistics of GERSHON-COHEN, DROGULA, URIST and others, it is occurred relatively rare in Japanese.

The author is of the opinion that the rare incidence in Japanese would be depend not only on the racial difference, but also on some nutritional conditions, although more investigations in this point are required to determine the cause.

On the other hand, URIST has found no evidence of osteoporosis in the spine of females over 100 years of age. In our series too, of 8 cases between age of 75-85, only two develop marked osteoporosis, and the others senile kyphosis

or/and spondylosis deformans.

The age and sex distributions of the cases are corresponding to that in the foreign reports (Table 2, 3).

Table 2 Age Distribution of Osteoporosis

	~39	~49	~59	~69	~79	~89	~90
Biström		3	17	21	7		
Cooke male	1	0	3	2	0	1	0
female	1	4	8	11	15	3	1
Kivilaakso			9	14	17	2	
Author male		0	5	3	1		
female		2	17	20	11		
total		2	22	24	12		

ROENTGENOLOGICAL FINDINGS

Roentgenograms of 74 cases aged from 47 to 80 are studied, among these 59 cases are mentioned above and 15 female cases are later included into.

The changes of the vertebral bodies are divided into three groups.

1. Frame vertebra with ground-

Table 3 Sex Distribution of Osteoporosis

	male	female	percent of female
Albright	2	40	95.2%
Black	612	167	82.3%
Cooke	7	43	86.0%
Drogula	82	298	78.4%
Author	9	50	84.8%

glass appearance and no deformities (Fig. 2a).....29 cases.

2. Severe cod-fish vertebra without any collapse of the vertebral body (Fig. 3).....2 cases.

3. SCHMORL's nodules, infraction of the vertebral plate and collapses of the vertebral body.....43 cases.

For osteoporosis of the vertebra proceeds of rare occurrence with the healthy disk, it may be shown only 2 cases in the 2nd group.

According to the precise observations of the 3rd group, the vertebral plate of typical cuneiform vertebra (Fig. 9a, b) reveals the same discontinuity as recognized in infraction of the vertebral plate (Fig. 4). In compression fracture with staircase like deformity on the anterior margin (Fig. 5), the upper surface is concave being resembled with cod-fish vertebra (Fig. 2 b). The uniconcave deformity recognized in lumbar region is analogous to concertina vertebra in the point of marginal sclerosis of the depressed corpora vertebrae except for the remaining posterior wall (Fig. 8). On the other hand, in advanced stage of concertina vertebra (Fig. 6b) the findings are closely resembled with cuneiform or plane deformity (Fig. 7).

Therefore these deformities are not essentially distinguished, and it would be reasonable to consider that in contrast with DROGULA these deformities as cuneiform and plane vertebrae belong to the category of the collapse or crush of the vertebral body.

These deformities are able to be reviewed more exactly by the planigram (Fig. 9c).

The incidence of the deformities is frequent in dorsolumbar segments, even of cuneiform and plane vertebra (Table 4). It makes sharp contrast with the frequent occurrence of the same deformities in the middle dorsal in western people. The fact suggests the reason why so frequently appears the dorsolumbar kyphosis in aged Japanese.

Table 4 Deformities of the Vertebral Body in Osteoporosis

	D.V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	L.I.	II.	III.	IV.	V.
S									2	1	3	1	
I	1								3	2			
C				1				1	6	8	4	3	
F						1			2	1			
K				1	2		4	6	5	2	1	1	1
P						1	1	1	2		1		

S : SCHMORL's nodule

I : Infraction of the vertebral plate

C : Concertina vertebra

F : Compression fracture

K : Cuneiform vertebra

P : Vertebra plana

Following complications are observed : Scoliosis 34%, spondylosis deformans with indistinct formation of osteophytes 39%, BAASTRUP's disease 22% and pseudospondylolisthesis 7%.

Five cases of osteoporosis are placed on the program of x-ray follow-up study after 12 to 46 months. In these cases the development of the deformities in the vertebral body took place within comparatively short period, though aggravation of subjective symptoms were not complained of. (Fig. 2, 6 & 9). The fact suggests that osteoporosis is not a physiological aging process but a specific disorder that requires orthopaedic measures.

SUMMARY

1) The incidence and distribution of osteoporosis is surveyed in Japanese patient. It is found that vertebral osteoporosis has rare occurrence in our country, but the age and sex distribution are corresponding to that in foreign reports.

2) The deformities of the osteoporotic vertebra are discussed. These are divided into three groups. Collapse of the vertebral bodies including cuneiform and plane vertebra are recognized mainly in D.XII~L.II. Because of severe complications and rapid appearance of collapse of the vertebra, vertebral osteoporosis requires careful orthopaedic measures.

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Fig. 2a Patient of 65 years. Osteoporosis without marked deformity.

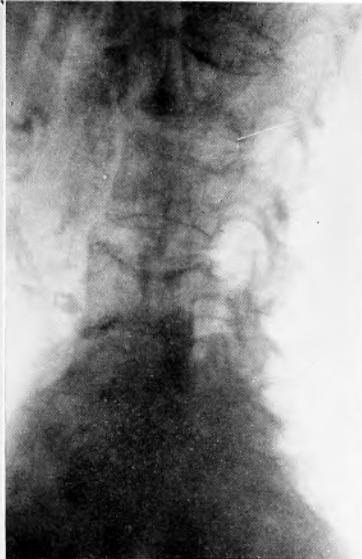


Fig. 2b 15 months later. The vertebra has developed into a cod-fish vertebra with BASTRUP'S disease.



Fig. 3 Patient of 78. Cod-fish vertebrae with SCHMORL'S nodules in L. II. & III.

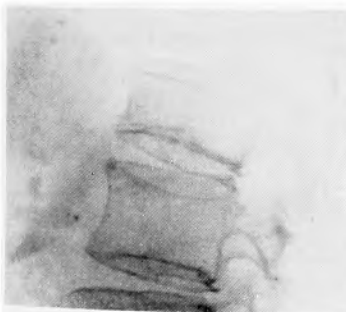


Fig. 4 Patient of 71, with a fracture of the vertebral plate in L. I.



Fig. 5 Patient of 62, with a compression fracture in L. I.

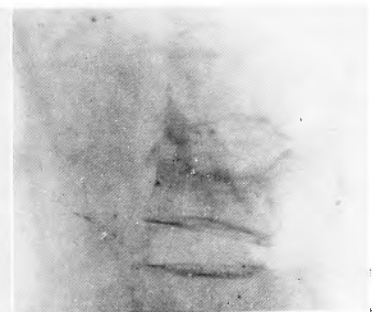


Fig. 6a Patient of 75, with a concertina vertebra in L. II.



Fig. 6 b After 13 months. The vertebral body has flattened with marked formation of osteophyte.

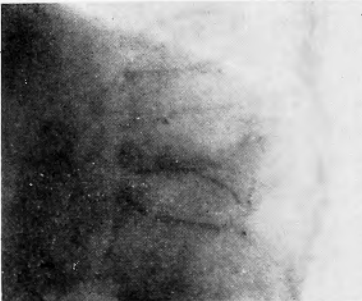


Fig. 7 Patient of 61, with a vertebra plana in L. I.



Fig. 8 Patient of 52, with a strongly uniconcave vertebra in L. IV.

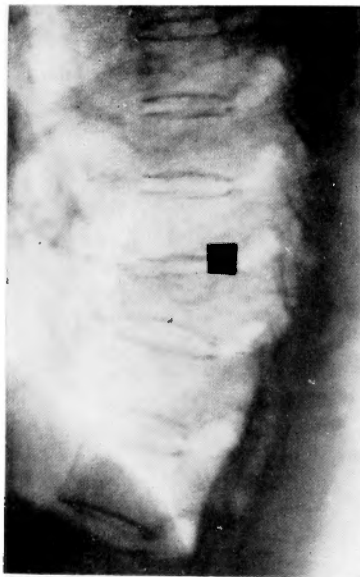


Fig. 9 a Patient of 69, with a cuneiform vertebra in B. VIII.



Fig. 9 b One year later. Additionally a compression fracture has occurred in B. X.



Fig. 9 c planigram

和文抄録

脊椎骨粗鬆症のレ線学的研究

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広 谷 速 人

京大整形外科を訪れた背腰痛患者1489名のうち、レ線骨粗鬆症を見出したのは59例(4.0%)である。全例とも40才以上(平均 60.8才)であつて、男性9例、女性50例である。性および年齢の分布は諸外国の報告にほぼ一致するか、その頻度は欧米人に比して著しく低い。

この59例にその後の15例(全部女性)を加えた74例(47~80才)に就き、そのレ線像を観察した。その変化は次の3型に分けるのが妥当であると考え、即ち

- 1) レ線透過性がまして frame vertebra の状態にあり著しい変形がないもの—29例
- 2) 著しい魚椎形成—2例
- 3) Schmorl氏結節、脊椎終板のInfraction, 圧迫骨折、とくにその特殊型である concertina vertebra, あるいは楔状椎、扁形椎などの、いわゆる椎体の collapse のあるもの—43例。

第2群が少ないのは椎体の骨粗鬆症と健全な椎間板の共存が稀であることを物語っている。また第3群に属する変形は互に移行が見られ、これらの間には何らの本質的な差異はないものと考えられる。またこれらの変形は第12胸椎~第2腰椎に多発しており、欧米ではことに楔状椎扁平椎が中部胸椎に多発しているのと対照的である。このことは欧米人に胸椎亀背が多いのに対し、日本老人にいわゆる腰曲りが多い原因をなすものではないかと思われる。

脊椎の異常として側彎34%, 変形性脊椎症 39%, Bastrup氏病22%, pseudospondylolisthesis 7%を見た。

なお5例の骨粗鬆症に就いて13~46ヵ月間経過観察したが、骨粗鬆症の変形は比較的短時間に、しかも何らの臨床症状の増悪を見ることなく発生することを知った。