Secondary Lumbar Spondylosis in University of Uyo Teaching Hospital, Uyo, Nigeria: Radiographic Correlation with Incidence and Concomitant Discovertebral Pathologies

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ABSTRACT

Introduction: Lumbar spondylosis is an age-related degenerative disk disease of the lumbar spine. It could be preceded by known discovertebral lesions resulting in secondary lumbar spondylosis. **Objectives:** To determine the incidence of secondary lumbar spondylosis using lumbosacral radiographic evaluations. **Study Designs/Settings:** A cross-sectional prospective study. Radiology Department, University of Uyo teaching hospital, Uyo, Nigeria. **Patient Sample:** Two hundred and sixty-two patients. **Outcome Measured:** Pathologies are evaluated based on features seen on twin lumbosacral radiographs that demonstrate secondary spondylosis. **Materials and Methods:** Anterior-posterior and lateral plain radiographs of patients were done under standardized conditions. Studied period was 1st May, 2011 to 12th July, 2012. Results were analyzed using SSPS 13. computer package. **Results:** A total of 262 patients aged 10-89 years with mean age of 48.9 and standard deviation of 25.4 were studied. Males were 138 and females were 124. 173 patients constituting 66.03% of the studied population had lumbar spondylosis. A total of 57 patients (female to male ratio − 1.36:1) had secondary lumbar spondylosis. This constituites 32.95% of population with spondylosis. Secondary lumbar spondylosis was commonest in the 4th to 6th decade. A total of 17.54% of patients with secondary spondylosis were younger than 40 years. The commonest associated pathology was spondylolisthesis, *n*=25 cases (43.86%) with female predominance. The least were septic spondylitis and trauma (1.75% each). Other conditions were osteoporosis, metastasis, lumbarization, spina bifida, and Pott's disease. **Conclusions:** The commonest coexistence with lumbar spondylosis in Uyo, Nigeria is lumbar spondylolisthesis.

Key words: Lumbosacral; radiographs; secondary; spondylolisthesis; spondylosis

Introduction

Spondylosis is an umbrella term for degenerative changes of the intervertebral disk, vertebral bodies, and/or associated joints of axial spine.[1] It is employed synonymously with disk degeneration, degenerative disk disease, spinal ostheoarthritis, degenerative spondylosis, intervertebral disk degeneration, arthrosis, and hypertrophic arthritis.[1-3]

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Spondylosis is characterized radiologically by the presence of osteophytes, disk space narrowing, and end-plate sclerosis.[1,2,4,5] Intervertebral disk degeneration is known to herald osteophytosis by increasing flexibility between the vertebral bodies.[5] This consequently places mechanical stress on the bones under the cartilage of the vertebral body leading further to sclerotic changes.[5] This sclerotic change is otherwise called end-plate sclerosis, whereas the hyperplastic change at the edge of the vertebral body is called osteophytosis. The presence of another disease entity on the lumbosacral spine which may or may not be demonstrated radiologically confer the term secondary spondylosis. Some of these entities may be recognized as predisposing factors. Such predisposing conditions include trauma, osteoligamentous injuries, spondylolisthesis, transition vertebrae, spina bifida, spondyloarthropathies, bone infections (like spondylitis,

Pott's diseases), metastasis, osteoporotic compressional fractures, and dialysis.

The commonest site of spondylosis in axial spine is in the cervical and lumbar spines, leading to terminologies like cervical spondylosis and lumbar spondylosis, respectively.[6-9] In both types of spondylosis, people over the age of 40 are more commonly affected.[4,10] In fact, 80% of patients older than 40 years are affected by lumbar spondylosis.[1]

There are myriads of radiological methods of investigating secondary spondylosis. But our careful choice of conventional radiography is because of its affordability, cheapness, availability, and noninvasiveness. An example of invasive tools is computed tomography in combination with myelography. This is valuable in detecting osteophytic myelopathy.

The utility of conventional radiography facilitates dual discovery of lumbar spondylosis and discovertebral lesions. The later could be a precedence or accompaniment of spondylosis warranting the diagnosis of secondary lumbar spondylosis.

Objectives

To evaluate incidence, sex distribution, and underlying discovertebral lesions in secondary lumbar spondylosis using lumbosacral radiographs.

Materials and Methods

Recruited in this prospective cross-sectional study were consecutive patients who were referred to do plain lumbosacral radiograhs in the Radiology Department of University of Uyo Teaching Hospital, Uyo, Akwa Ibom State, Nigeria. Studied period was from 1st May, 2011 to 12th July, 2012. Enrolment of patients was regardless of their clinical presentations. Their biodata were documented. Patients consent was mandatory prior to examinations. Anterior-posterior and lateral radiographs of the lumbosacral spine were obtained under standardized conditions from each patient. Lumbar spine radiographs were taken according to a standard protocol with the film centred at L2. The paired radiographs were subsequently evaluated by a single observer for the presence of the individual radiographic features of lumbar spondylosis and associated secondary features from vertebral level L1/2 to L4/5. Inclusive criteria included reportable pair of radiographs and exclusive criteria included nonstandardized and nonreportable films.

Osteophytes, disk space narrowing, end-plate sclerosis, and vacuum phenomenon were radiographic features primarily sought for in establishing the diagnosis of lumbar spondylosis. We considered the above radiographic features as primary lumbar spondylosis when purely devoid of any radiographic associations. These additional features being precedential or not were discountenanced in this study.

Spondylolisthesis diagnosis was based on vertebral anteriolisthesis (anterior slip of a vertebra with respect to an inferior) or retrolisthesis (posterior slip). Transition vertebra was considered when lumbar vertebrae are numerically below or above five. Pott' disease shows as anterior wedging, kyphus deformity, disk space narrowing, and paraspinal shadows Spina bifida is midline cleft of vertebral arch. Other conditions were considered according to known prescribed radiographic features.

Data were documented and analyzed using SSPS 13 computer package.

Results

A total of 262 patients were studied within the studied period [Table 1]. They were aged 10-89 years with mean age of 48.9 and standard deviation of 25.4. Males were 138 with median of 12.5 and females were 124 with median of 5.0. A total of 173 patients had lumbar spondylosis constituting 66.03% of the total population (female to male ratio was 1.01:1). Of this number, the number of patients with features of secondary lumbar spondylosis was 57 constituting 21.76% of total population and 32.95% of the population with lumbar spondylosis. Their female to male ratio was 1.36:1.

Secondary lumbar spondylosis was commonest in the 4th to 6th decade with peak in the 5th decade (29.82%). A total of 17.54% of patients with secondary spondylosis were younger than 40 years. No recordable case was seen in extreme age of life.

The commonest associated pathology was spondylolisthesis 43.86% (n=25 cases). [Figures 1 and 2]. Lumbar spondylolisthesis showed a female to male ratio of 4:1 with peak in both sexes from 4th decade [Figure 2].

Other associated pathologies were osteoporosis 15.79% (9 cases), bony metastasis 12.28% (7 cases), Pott's disease 10.53% (6 cases) lumbarisation 7.02% (4 cases), spina bifida occulta 7.02% (4 cases), trauma (compressional fracture) 1.75% (1 case), and septic spondylitis 1.75% (1 case) [Figure 1 and Table 2].

Table 1: Studied population

Age range	Males	Females
0-9	0	0
10-19	5	2
20-29	11	8
30-39	14	16
40-49	25	40
50-59	31	39
60-69	29	15
70-79	15	2
80-89	8	2
90-99	0	0
Total	138	124

Discussion

Lumbar spondylosis has pathogenetically been considered to be a degenerative cascade of three overlapping phases of dysfunctional, instability, and stabilization phases.[1] The first phase involves the initial repetitive micro-trauma of the inter-vertebral disk and subsequent circumferential tears of annulus fibrosus.[1] This leads to disk nutritional compromise, desiccation and reduced disk height.[1] Second phase is facet degeneration, subluxation, and mechanical instability.[1] Third phase is stabilization with formation of osteophytes, subchondral sclerosis, and transdiscal bridging.[1]

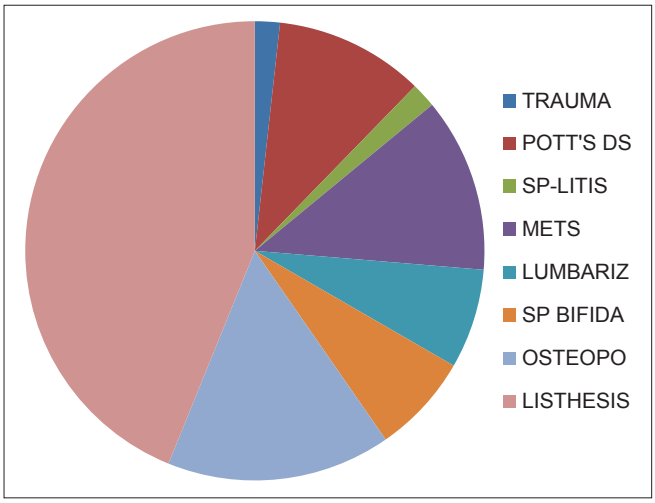

Figure 1: Pie chart showing the different lesions seen in secondary lumbar spondylosis

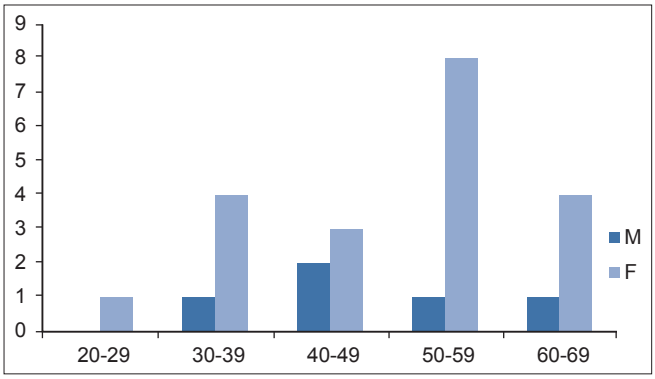

Figure 2: Age and sex distribution of spondylolisthesis

It, therefore, implies that any condition that will exaggerate the first phase of repetitive microtrauma will provoke degenerative cascade. Frank lumbar spinal trauma and spondylolisthesis are handy in this respect. Little wonder spondylolisthesis is the major factor involved in secondary lumbar spondylosis in this study [Figure 1 and Table 2]. It accounted for 43.86% of all cases with female predominance of 4:1 [Figure 2]. There are five types of spondylolisthesis namely isthmic, degenerative, traumatic, dysplastic, and pathological.[10,11] The spectrum of disease in the commonest type of spondylolisthesis (isthmic type) range from bone stress (earliest sign) through spondylolysis (a nondisplaced fracture of the pars interarticularis) and spondylolisthesis proper.[12,13] Similarly, traumatic spondylolisthesis results from bilateral avulsion of the neural arches from the vertebral body with or without subluxation.[13] From the foregoing, the common denominator for spondylolisthesis and spondylosis appears to be microtrauma. A typical example noted in this study is a 33-year-old female who had retrolisthesis of L1 as a result of road traffic accident and subsequently developed severe secondary lumbar spondylosis at such an early age.

Vertebral bodies are joined by the intervertebral disk and this provides great stability to the spine. Disk comprises of annulus fibrosus peripherally and a central gel-like nucleus pulposus.[6,14] Collagen fibers, water, and protoglycan containing glucosamine form nucleus pulposus.[1,6] The water content of the nucleus decreases with age affecting its ability to rebound following compression (e.g., shock-absorbing quality).[6] Aging process has been recognised as the strongest factor in the development of lumbar spondylosis due to compromise in disk nutritional supply and desiccation resulting from

Table 2: The different lesions seen in secondary lumbar spondylosis

Age range	Trauma		TB		Spon-litis		Mets		Lumbariz		SP bifida		Osteop		Listhesis		Total
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
0-9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-19	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	2
20-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
30-39	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	4	7
40-49	0	0	0	2	0	0	0	0	1	1	1	0	0	0	2	3	10
50-59	1	0	0	1	0	0	3	0	0	1	1	0	0	1	1	8	17
60-69	0	0	1	0	0	1	2	0	0	0	0	0	0	3	1	4	12
70-79	0	0	0	0	0	0	2	0	1	0	0	0	2	0	0	0	5
80-89	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	3
90-99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	2	4	0	1	7	0	2	2	3	1	4	5	5	20	57

TB – Tuberculosis

glucosamine loss and consequent loss of disk height.[1,6,15,16] The degenerative effects of aging can also weaken the annulus fibrosus' structure, causing wear or tear, increase the risk for disk herniation and spondylosis.[6]

In same vein, degenerative spondylolithesis is a disease of the older adult and rarely occurs before the age of 50 years.[17] The diagnosis of degenerative spondylolisthesis is made when in addition to vertebral displacement, other features like osteophytosis, disk space narrowing, and end-plate sclerosis are seen.[18] The later three conditions also collectively define spondylosis suggesting interrelationship of aetiogenesis of degenerative spondylolisthesis and spondylosis. Typically, spondylolisthesis is associated with age-related facet remodelling and disk space narrowing of the parent disk.[10,17] These are same instigating factors in lumbar spondylosis formation.

Pathological conditions that can cause intervetebral disk cartilage destructions include Pott's disease, septic spondylitis, and discitis.[19] This invariably reduces the normal resilience of the disk cartilage in protecting physical loading and gravitational force.[1] This naturally will culminate in spondylosis. Since this type of spondylosis is predated by a disease condition; it, therefore, qualifies as secondary spondylosis. A total of 10.53% of our observed results had Pott's disease with 100% multilevel vertebral body involvement.[20] Mukherjee *et al*., in their study observed 54.90% of their patients had two-body and 19.61% had three-body involvement.

Instability of the intervertebral disks may also result from conditions like congenital vertebral deformities.[1] Examples are transition vertebrae and spina bifida. Lumbarization and spinal osteoporosis are examples of conditions that increase the mechanical loading on the lumbar spinal disk cartilage and influence vertebral kinematics. These altered weight mechanisms and pressure relationships on vertebral bone and joint spaces are believed to influence osteophyte formation and facet hypertrophy.[1] Transition vertebrae involved the downward migration of L5 (sacralization) or upward migration of S1 (lumbarization).[5] Transition vertebrae cause low-back pain. Lumbarization in southern adult Nigerians is rare with an incidence that is half that of sacralization.[5,21] Igbinedion and Akhigbe, however, recorded that 32.3% of their patients had transitional vertebrae, of which 5.9% had lumbarization and 26.4% sacralization. In that same study, 2.4% males and 3.6% females had lumbarization and 15.7% males and 10.7% females had sacralization.[5] In our own study, lumbarization was seen in four cases (7.02%) with equal male to female ratio. The earliest age of discovery was 4th decade. This late presentation of an anatomical variant is probably due to its asymptomatic nature. Symptomatology, therefore, arose on receipt of secondary spondylosis. However, Igbinedion and Akhigbe did not observed any statistical correlation between transitional vertebrae with sex, age group, body mass index, osteophyte formation, vacuum phenomenon, disk degeneration, and spondylolisthesis.[5]

Generally, the incidence of lumbar spondylosis in this study is high but below the findings in certain studies.[1] For example, our incidence of 66.03% is below 74%-85.5% seen in some studies.[1,22] Our lower value is probably due to the fact that ours was an all inclusive study without sample bias. This is unlike other studies that placed a cut-off point of 40 years for enrolment.[1,22] The basis of their age criterion is because aging process as mentioned earlier is the strongest risk factor for bony degeneration, particularly within the spine.[1,7,8,16,23-25] Nevertheless, the bulk of our unfettered study population were from 40 years and above. And our observed incidence of spondylosis (secondary) in this age groups is 82.46%, which is still comparable to the usual high values seen in advancing age.[1,22] A total of 17.54% of our studied population with secondary spondylosis were before their 4th decade of life, with the youngest in the second decade. Infections (especially tuberculous), spondylolisthesis and spina bifida occulta were the culprits. The later is a congenital midline defect of fusion of the vertebral arch without protrusion of the spinal cord or meninges with L5 and S1 being the most commonly involved vertebrae.[26,27] The majority of individuals with spina bifida are asymptomatic although there is an increased incidence of tethered cord syndrome and secondary lumbar spondylosis.[26,27]

Other associations of spondylosis are osteoporosis and dialysis. In osteoporosis associated lumbar spondylosis, there is central wedging of the collapsed vertebrae which places an unusual strain on the disk cartilages.[19] This stimulates osteophytic formation as a buttressing tool. Realizing that osteophytes are integral component of spondylosis.[23,25,28]

Dialysis-associated spondylosis is accompanied by advanced spine instability, lumbar spinal canal stricture, amyloid deposition in dura mater, and destructive spondyloarthropathy.[29]

The incidence of secondary lumbar spondylosis in this study is 32.95% which is less than that of primary lumbar spondylosis. The implication is that the usual overbearing influence of aging in etiogenesis of lumbar spondylosis is preserved despite the presence of any competing trigger. Further corroborating point is the low incidence of secondary lumbar spondylosis (17.54%) prior to 4th decade of life in this study.

Be that as it may, it is still pertinent we observed spondylosis as early as the second decade of life. This creates room for the existence of triggers of secondary spondylosis as in this study no matter how modest the effect may be.

The limitations of this study are that there was no previous study that assessed the enrolee before the onset of lumbar spondylosis. This would have established lumbar spondylotic

forerunners. It, therefore, becomes difficult to rule them out as either preemptive, simultaneous, or concurrent conditions.

Conclusion

Spondylolisthesis is the commonest accompaniment of lumbar spondylosis in Uyo, Nigeria. Such spondylosis when preceded or coexistent with another discovertebral lesion has some downplaying influence of aging.

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