

RADIOGRAPHY OF LUMBOSACRAL COLUMN IN ACUTE LUMBAR PAIN: USE OR OVERUSE? EXPERIENCE IN THE EMERGENCY SERVICE OF TWO HIGH-COMPLEXITY CENTERS IN BOGOTÁ, COLOMBIA



Palabras clave (DeCS)

Dolor de la región lumbar
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Key words (MeSH)

Low back pain
Lumbosacral region
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Radiografía de columna lumbosacra en dolor lumbar agudo: ¿uso o sobreuso? Experiencia en el servicio de urgencias de dos centros de alta complejidad en Bogotá, Colombia

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Summary

Introduction: Low back pain is a disease with a high frequency and a recurrence worldwide, there are absolute indications to request radiography, avoiding its increase and associated costs. *Objective:* To determine the frequency of the use of lumbosacral spine radiography requested to adult patients with acute low back pain who entered the emergency room at two clinics of high complexity during 2016 and the associated costs. *Methodology:* Descriptive cross-sectional study. Sample of 192 patient diagnosed with acute low back pain with lumbosacral spine radiography and who met the inclusion criterio. The prevalence of red flags were calculated, symptoms and background that justified the request, as well as the main radiological findings of unjustified radiographs and their associated costs. *Results:* The frequency of the request for radiography in the emergency departments related to low back pain was 56.43%. More than half of the radiological findings are degenerative. 13.54% of the radiographs were not indicated by red flags and 9.37% were not indicated by

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red flags or associated symptoms. The associated costs were 15.926 USD /year. *Conclusions:* Lumbosacral spine radiography has a low diagnostic yield in patients with acute low back pain who enter the emergency room due to low specificity and low sensitivity, lack of patient preparation, and should not be requested in this service, unless there is high suspicion, with a physical examination and exhaustive interrogation.

Resumen

Introducción: El dolor lumbar es una enfermedad con una alta incidencia y recurrencia en el mundo. Hay indicaciones absolutas para solicitar la radiografía con el fin de evitar el aumento en su utilización y los costos asociados. *Objetivo:* Determinar la frecuencia del uso de la radiografía en pacientes adultos con dolor lumbar agudo que ingresaron al servicio de urgencias en dos clínicas de alta complejidad en Bogotá durante el 2016 y los costos asociados. *Metodología:* Estudio descriptivo de corte transversal. Muestra de 192 pacientes con dolor lumbar agudo, con radiografía de columna lumbosacra, que cumplieron criterios de inclusión; se calcularon las prevalencias de banderas rojas, síntomas y antecedentes que justificaron la solicitud, así como los principales hallazgos radiológicos de radiografías no justificadas y los costos asociados. *Resultados:* La frecuencia de solicitud de radiografías en el servicio de urgencias relacionadas con el dolor lumbar fue de 56,43 %. Más de la mitad de los hallazgos radiológicos son degenerativos. El 13,54 % de las radiografías no estaban indicadas por banderas rojas y el 9,37 % no estaban indicadas ni por banderas rojas ni por síntomas relacionados, los costos asociados fueron 15.926 USD/año. *Conclusiones:* La radiografía de columna lumbosacra tiene un bajo rendimiento diagnóstico en el paciente con dolor lumbar agudo que ingresa a urgencias, por la baja especificidad y sensibilidad y la falta de preparación del paciente, por lo cual se debe solicitar solo ante alta sospecha de lesión, luego de un examen físico e interrogatorio exhaustivo.

Introduction

Low back pain is defined as pain, tension or stiffness in the area between the lower costal fence and the lower gluteal fold, whether or not accompanied by pain in the lower extremities (1). The lifetime prevalence of low-back pain is estimated to be at least 60-70 % (2). In Colombia, low back pain was the second cause of work-related pathology (22 %) between 2001 and 2003 (3,4) and its prevalence in the general population is not known exactly.

Additionally, there is a high percentage of patients who improve in a short time without any type of treatment and the diagnostic image is, in most cases, normal, which suggests that it is necessary to limit the use of diagnostic images in the management of acute low back pain in previously healthy patients (1,4).

The percentage of patients who do not recover is responsible for 75 to 90 % of the total expenses related to this pathology, 75 % of these costs are attributed to indirect expenses - compensation, economic benefits for work incapacities and sequelae - while less than 25 % are direct expenses corresponding to procedures performed, hospitalizations, medications, outpatient controls and even treatments such as acupuncture (4,5). Imaging techniques such as lumbosacral spine radiography, computed tomography (CT) and magnetic resonance imaging (MRI), together with appropriate clinical examination, determine the cause of low back pain in only 15 % of cases, when there is no herniated disc or neurological deficit (4,5).

For a diagnostic approximation of low back pain, an adequate anamnesis and physical examination are used, taking into account the red flags or alarm signs among which are: age of onset of low back pain less than 20 or more than 55 years, recent history of trauma, history of

malignant tumour, prolonged use of corticosteroids, immunosuppression, unexplained weight loss, neurological symptoms including those of equine cauda syndrome and fever. Any of these signals force the exclusion of the diagnosis of non-specific low-back pain, and become an absolute indication for studies of images in search of pathologies that explain the cause of low back pain for a specific treatment (5,6).

It is estimated that around 75 % of people have had some episode of low back pain throughout their lives, most of which improve spontaneously within six to twelve weeks, but between 5 and 15 % do not respond to treatment and between 40 and 90 % of these cases recur in the following year, becoming one of the problems with the greatest economic impact on the health system, given the increase in disabilities and the high costs of analgesic and therapeutic treatments (7,8).

Simple radiography is the first line technique in patients with low back pain, due to its wide availability, with a sensitivity in the detection of fractures of up to 87 % (9, 10). Some studies have shown that up to 70 % of patients admitted with acute spinal pain undergo x-rays, of which 42 % have normal results, 36 % show degenerative changes that did not change the therapeutic behavior and only 0.4 % of patients found radiological findings with therapeutic relevance, with findings of trauma or metastasis. This allows to conclude that spinal radiography is unnecessary in the evaluation of the patient with non-specific acute back pain and does not improve clinical outcome (11-13).

The demand for lumbosacral spine radiography has increased in recent times, even though we know that in most cases the results are normal. This entails high costs for the third payer, high doses of irradiation for the patient, without taking into account the long-term side effects, especially in young and female patients.

In Colombia, there are gaps in knowledge regarding the frequency of request for lumbosacral spine radiography in patients with acute low-back pain who go to the emergency department and the costs associated with the use of this diagnostic modality. The objective of this study was to determine the frequency of request for radiographs for the study of patients with acute low-back pain in emergency departments, their positive findings, the number and cost of X-rays requested without justification supported by guidelines established in the scientific literature.

Material and methods

A cross-sectional descriptive study was conducted during the observation period from January to December 2016. A sample size of 192 patients was calculated from the estimated value of radiographic consultations for this condition in the year immediately prior to the study, with an accuracy of 3 % and an error of α 5 %. X-rays of the lumbar spine taken from patients over 18 years of age were analyzed for unspecified lumbago, ICD 10 (International Classification of Diseases 10th revision) M545, lumbago with sciatica CIE 10 M544 and unspecified dorsalgia CIE 10 M549), during emergency care in two health institutions in Bogotá, Colombia.

The stored images were accessed through a unified platform for the management of IMPAX digital images, and the information related to clinical characteristics, reason for consultation and description of the clinical picture was obtained from the review of the clinical history in the SOPHIA system.

Data related to risk factors were collected, mainly demographic ones, such as age and sex, as well as the red flags or alarm signals within which they are located: age of onset of lumbar pain less than 20 or greater than 55 years, recent history of trauma, history of malignant tumor, prolonged use of corticosteroids, immunosuppression, unexplained weight loss, neurological symptoms (including those of *equine cauda* syndrome), and fever; any of these signs were considered absolute indications for imaging studies for pathologies explaining the cause of lumbar pain.

The cost associated with performing lumbar spine x-rays without positive findings or indications was estimated, and the frequency of x-rays with these criteria was quantified at the end of the analysis period. The allocation of costs took into account the type of X-ray and the total value in dollars (USD) was presented at the official rate in December 2016.

The analysis was carried out using descriptive statistics, absolute and relative frequencies, measures of central tendency and dispersion according to the nature and distribution of the data were used. These were presented with their respective 95 % confidence interval.

The statistical software STATA 14® was used for the analysis.

Results

During the observation period from January to December 2016, a total of 5,784 emergency consultations related to low-back pain were recorded. The frequency of requests for radiographs of the lumbosacral spine was 3,264 requests, corresponding to 56.43 % of these consultations [CI 55.2-57.7]. 192 patients or participants with their respective radiographs were included in the study. The median age of the participants was 50 years in a range of 18 to 97 years. 65.63 %

were women and 34.38 % were men. Of the two imaging modalities performed, lumbosacral radiography and dorsolumbar radiography, the most frequent was lumbosacral spine radiography (77.6 %). The percentage of X-rays with positive pathological findings was 69.8 % and the remaining radiographs (30.2 %) showed normal results (Table 1).

Table 1. Demographic characteristics (age and sex) and radiographic findings

Characteristics	n 192 (%)	IC 95 %
Age*	50	(18-97)
Sex		
Men	66 (34.38)	27.66-41.09
Women	126 (65.63)	58.91-72.34
Findings		
Normal	58 (30.2)	23.7-36.7
Pathological	134 (69.8)	63.3-76.3

*Medium and rank

The most frequent diagnosis of admission was unspecified lumbago (27.54 %), followed by fracture of the lumbar vertebra (4.32 %) and lumbago with sciatica with the same percentage.

The percentage of admission diagnoses other than low back pain was 22.91 % (44, n =192) of which was cervical pain and other head trauma, specified at 2.16 % for each, followed by fracture of the diaphysis of the tibia with 1.62 %.

The diagnosis of discharge with the highest proportion was unspecified lumbago (23.43 %), followed by hip contusion (5.4 %) and lumbosacral contusion (4.86 %), and others (66.31 %).

The findings most frequently found in total radiographs were those associated with degenerative pathology: discopathy (36.98 %), spondylotic changes (30.73 %) and osteopenia (29.69 %); the least frequent was interspinous rubbing (3.13 %) (Table 2).

Table 2. Degenerative radiological findings

Characteristics	n 192 (%)	95 % CI	
Discopathy	71 (36.98)	30.15	43.81
Spondylose changes	59 (30.73)	24.20	37.26
Osteopenia	57 (29.69)	23.22	36.15
Facet osteoarthritis	52 (27.08)	20.80	33.37
Coinage Fracture	34 (17.80)	12.31	23.11
Anterolistesis	18 (9.37)	5.25	13.50
Retrolistesis	8 (4.17)	1.34	6.99
Interspinous friction	6 (3.13)	0.66	5.59

Among the associated symptoms studied as a factor favouring requests for x-rays in the emergency department - including neurological symptoms such as red flags - a higher percentage of paresthesias (9.9 %) [95 % CI; 5.67-14.12], weakness in one limb and sphincter

dysfunction (0.52 %) [0.0-1.54] for each were found; no weakness was observed in both limbs.

Among the symptoms triggering low-back pain, cough was the only one reported. There were no patients with motor symptom, instability or foot drop.

With regard to red flags, as an absolute indication of the request for radiography in the patient with low-back pain, the highest percentage was the history of trauma (126) with a percentage of 65.62 % (Table 3).

Table 3. Red flags as absolute indication of request for radiography

Characteristics	n 192 (%)	95 % CI	
Trauma	126 (65.62)	58.91	72.34
Age <20->50 years	97 (50.52)	43.45	57.59
Weight loss	58 (30.21)	23.71	36.70
Immunosuppression	58 (30.21)	23.71	36.70
Osteopenia	57 (29.69)	23.22	36.15
History of cancer	16 (8.3)	4.4	12.2
Corticosteroid use	11 (5.73)	2.44	9.02

Table 4. Frequent positive findings found in the radiography of patients with red flags

Positive X-ray findings	Red flags			
	Trauma n = 126 (%)	Age <20- >50 years old n = 97 (%)	History of cancer n = 16 (%)	Corticosteroid use n = 11 (%)
Discopathy	38 (30.1)	52 (53.60)	12 (75)	8 (72.72)
	CI 22.1- 38.2	CI 43.7- 63.5	CI 23.6-42.3	CI 16-74.9
Osteopenia	32 (25.3)	54 (55.67)	9 (56)	7 (63.63)
	CI 17.8- 33.0	CI 45.8- 65.6	CI 31.9-80.6	CI 16-74.9
Spondylotic changes	31 (24.6)	48 (49.48)	6 (37.5)	5 (45.45)
	CI 17.1- 32.1	CI 39.5- 59.4	CI 13.8-61.2	CI 16- 74.9
Facet osteoarthritis	30 (23.8)	42 (43.24)	7 (43.7)	8 (72.72)
	CI 16.4- 31.2	CI 33.4- 53.2	CI 19.4-68.1	CI 16-74.9
Coinage fracture	25 (19.8)	32 (32.98)	3 (18.7)	3 (27.27)
	CI 12.9- 26.8	CI 23.6- 42.3	CI 0.0-37.9	CI 1.0-53.6

Of the 126 patients with a history of red flag trauma (63.4 %), at least one positive finding was found on radiography, the most frequent being discopathy (30.1 %), followed by osteopenia (25.3 %) and spondylotic changes (24.6 %) (Table 4).

In terms of age as red flag <25->50 years, 97 patients were found to meet this criterion (50.52 %); of these, the pathological findings described in the most frequent radiology reports were osteopenia (55.67 %), followed by discopathy (53.60 %) and spondylotic changes (49.48 %) (table 4). Within the red flags, the history of cancer was found in 16 patients (8.3 %) of the total number of patients who underwent an X-ray; the most frequent pathological findings are described in table 4. The most common symptoms were a sign of positive Lasègue and hypesthesia, both with a percentage of 6.66 %.

The history of consumption of corticosteroids as red flag was found in 11 patients (5.72 %) and in this group the positive findings were: facet osteoarthritis and discopathy, both with a percentage of 72.72 %, followed by osteopenia (63.63 %) (Table 4). The most frequently found associated symptom was the positive Lasègue sign with a percentage of 9.09 %.

There were no patients with red flags for fever, weight loss or immunosuppression.

As for the behaviour taken by the doctor as a result of the ER consultation, the most frequent was exit with analgesia prescription (46 %), followed by analgesia prescription and specialist control (13.54 %). The percentage of patients discharged with a prescription for analgesia was 80.20 % (154 n =192) (Table 5).

Table 5. Conduct taken in patients with acute low-back pain admitted to the emergency department

Characteristics	n 192 (%)	CI 95 %	
Output with analgesia	89 (46.28)	39.30	53.41
Analgesia + control by specialist	26 (13.54)	8.7	18.4
Analgesia + control by specialist + additional examination (tomography or resonance)	23 (11.97)	7.4	16.6
Hospitalization by specialist	21 (10.93)	6.5	15.4
Output with analgesia and outpatient control	7 (3.64)	0.99	6.30
Exit with analgesia and physical therapy	4 (2.08)	0.06	4.10
Exit, analgesia and immobilisation	1 (0.52)	0.0	1.54
Pre-exit tomography	1 (0.52)	0.0	1.54
Hospitalization	7 (3.64)	1.0	6.3
Surgery for removal of instruments	1 (0.52)	0.0	1.54
Analgesia assessment by hip surgeon, physical therapy	1 (0.52)	0.0	1.54
Referred by low hemoglobin	1 (0.52)	0.0	1.54

Taking into account the absolute indications understood as red flags for the request for radiography in the emergency department, 13.54 % of the requests were qualified as not indicated (26/192). Of this group

(8/26) they had no secondary or specific low back symptoms described in the clinical history. The costs of lumbosacral spine radiography in the sample not indicated by red flags or associated symptoms was USD 656.26 at the official rate of December 2016.

Discussion

Low-back pain is a disease with a high incidence and worldwide recurrence. It is the cause of a significant number of emergency department visits. Eighty-five percent of cases have a good prognosis, with improvement within 6 to 12 weeks (1-6).

This study was able to determine the frequency of request for lumbosacral and dorsolumbar spine radiographs of patients admitted to the emergency department for low-back pain in 2016 (56.43 %) [CI 55.2-57.7], a finding that approximates those found in the literature (70 %) (14). Of the analyzed sample, 30.20 % [95 % CI; 23.7-36.7] was read as normal, this value is slightly lower than that reported in the literature (42 %), which can be explained by the operative definition of normal radiography used in this study, which refers strictly to the absence of positive findings (11-13).

In 58 % of the requested radiographs there were radiological findings associated with degenerative pathology, the most frequent being: discopathy, spondylial changes and osteopenia. Although this percentage was higher than that described in the literature (36 %) (11-13), patients do not require emergency management due to their chronic nature and because their presence is not specific to patients with low back pain. Therefore, the taking of x-rays and their findings in these cases does not result in a different behavior for pain management.

On the contrary, in a particular subgroup of patients, radiography modified their therapeutic or follow-up behavior in the emergency department. This group corresponds to patients with a history of trauma, such as red flag and symptoms; in radiography, fracture by coining was confirmed (18.75 %); these patients required complementary diagnostic images, hospitalization and management by spine specialists. Although the history of trauma in the sample was 65.62 %, it could be observed that the positive predictive value of this red flag increases when taking into account the nature of the trauma, the characterization of its mechanism and the associated signs and symptoms.

Another finding of interest with a percentage of 30.76 %, $n = 8/26$, is that of patients without red flags, but with associated symptoms, especially paresthesias (100 %) and Lasègue positive sign (20 %), where there was no change in management behavior (analgesia and medical discharge), which may be secondary to the lack of standardization in the definition of paresthesias, the difficulty in objectively measuring them or the low sensitivity of this symptom in the diagnosis of lumbar pathology. The recommendation of the American College of Physicians (ACP) and the American Pain Society (APS) for diagnostic imaging in patients with low back pain and neurological disturbances is only for those with severe or progressive neurological deficits or signs or symptoms suggestive of an underlying or specific serious condition, since routine imaging does not improve clinical outcomes and exposes patients to unnecessary harm (15,16).

The percentage of X-rays performed in this study that were not indicated by red flags was 13.54 %, and the percentage of X-rays that were not justified by red flags or associated symptoms was 9.37 % (18/192). This value constitutes a high percentage of radiographs

without absolute indications supported in the literature, and may reflect non-compliance with protocols or institutional guidelines.

As for the costs of radiographs that did not have absolute indications understood as red flags, it was 15,926 USD/year, which added to direct secondary costs to the prolongation of the patient's stay in the emergency department, as well as the increase in the workload in the radiology department and the emergency department and, more importantly, the increase in the radiation dose to the patient without obtaining a change in behavior, should lead to questions about the efficiency of radiography for low-back pain in the emergency department.

It is important to consider that the value of radiography as a diagnostic tool for osteoarticular pathologies depends on the pretest probability of finding such pathology. This, in turn, improves with an adequate interrogation in search of red flags, characterization of the pain and an exhaustive clinical examination in search of positive signs. X-rays as the only diagnostic tool are not sufficiently sensitive and specific to change behaviour in the emergency department, so in the event of a high suspicion, other diagnostic modalities should be chosen (17).

Likewise, specificity is low since, as we see in this study, more than half of the findings reported as positive may correspond to chronic changes, which are not the cause of acute low-back pain and will not modify medical behavior.

This study presents, as strength, the frequency of use of radiographs in the patient with low back pain who comes to the emergency department; it also offers information about radiological findings, the most frequent associated symptoms and their costs; a study of these characteristics, with a significant sample size, offers a perspective of the diagnostic approach by radiographs in the care of acute low back pain as a general disease.

Within the limitations of this study are those of the retrospective design, such as information bias and, additionally, the presentation of some pathologies that may be superior in prevalence in the general population because it is a reference center in the city of study.

Conclusions

The request for spinal radiography in patients who come to the emergency department with low back pain is observed with a frequency of more than 50 % of consultations in one year in the two institutions. The percentage of pathological findings from radiography was 69.8 % and the remaining radiographs (30.2 %) were read as normal, the pathological findings most frequently found were those associated with degenerative pathology. With regard to the medical conduct taken in the emergency department, the percentage of patients who were discharged with a prescription for analgesia was 79.16 %, without any other type of intervention, which makes it seem unnecessary to request an X-ray.

Spinal radiography has a low diagnostic performance in patients with acute low back pain who are admitted to the emergency department, due to the low specificity and sensitivity due to the lack of preparation of the patient, so it should not be performed in the emergency department, unless there is a high suspicion of relevant pathology, so a physical examination and exhaustive interrogation are essential.

The practice of a lumbosacral spine radiography, without taking into account red flags as an absolute indication, increased the costs for third party payers by around USD 15,926 in the population studied.

There is a need for standardization of the indications for the use of radiography in patients in the emergency department and plans to generate study protocols for these patients with low-back pain who consult the emergency department, in order to reduce unnecessary exposure to radiation, waiting times in the emergency department and the direct costs associated with taking radiographs for the study of low-back pain in the emergency department.

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