CONCLUSIONES

De forma general, la investigación determinó que la secuencia T2 panorámica en el examen de resonancia magnética de columna lumbosacra tiene utilidad diagnóstica por permitir obtener un 50% más de hallazgos adicionales en comparación al estudio convencional. Los hallazgos principales tanto en columna lumbosacra como en segmentos cervical y dorsal correspondieron a enfermedades degenerativas, las hernias discales fueron las más frecuentes, y la localización lumbosacra de mayor aparición fue en el disco intervertebral L5-S1.

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Panoramic T2 sequence in magnetic resonance imaging of the lumbosacral spine

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ABSTRACT

Objective: To evaluate the usefulness of the panoramic T2 sequence in magnetic resonance imaging of the lumbosacral spine at the Clinica Internacional - San Borja in 2016. **Materials and Methods:** This is a quantitative, prospective and cross-sectional research. The population comprised 357 patients and the sample comprised 186 cases. The unit of analysis was the patient between 18 and 60 years old, attended in the doctor's office, to whom a magnetic resonance imaging (MRI) of the lumbosacral spine was performed. The data collection was done through a registration form, consisting of a general data sheet, since the examination request, and an analysis sheet. **Results:** Out of total population, 80.1% were adults; 53.8%, female; and 52.7% had a diagnostic presumption of herniated disc. The highest percentage of findings was degenerative diseases, reaching 93%; being the most frequent ones, herniated discs, reaching 60%. Likewise, the usefulness of the panoramic T2 sequence was evaluated by means of hypothesis test and it was proved that this allows obtaining 50% more findings than the conventional study. **Discussion:** The results obtained reaffirm the importance of lumbosacral spine resonance for the different types of pathology. It is demonstrated that the application of the panoramic T2 sequence is useful to obtain greater number of findings. **Conclusion:** In general, the research determined that the panoramic T2 sequence in the MRI examination of the lumbosacral spine has diagnostic usefulness; that the main findings in the lumbosacral spine, as well as in the cervical and dorsal segments, were degenerative diseases; and, out of these, herniated discs are the most frequent.

Key Words: Lumbosacral spine. Panoramic sequence. Magnetic resonance.

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INTRODUCTION

During the last decades, the Peruvian population has suffered a demographic transition that is evidenced in lower mortality rates; the demographic decrease of dependency, with the consequent increase in the economically active population –both of employees and workers-; and an increase of aging population, with a life expectancy of 74 years. As a result, cases of infectious diseases have decreased and those of chronic-degenerative diseases have increased[1]. Among them, there are dorsopathies, the sixth cause of morbidity in outpatient clinic, with 3.2% of prevalence (3.3% in women and 3.0% in men) which increases as the life cycle progresses: 2.4% in young people, 5.6% in adults (the third most important cause), and 6.9% in older people (the second most important cause). Even nowadays, this is a cause of morbidity in adolescents, representing 1.3% of pathologies, a situation which did not occurred before in the last ten years[2].

In this sense, the spinal region, and, especially, the lumbosacral spine, is subject to review and clinical assessment, but mainly radiological, because this is the most useful for diagnosis. The magnetic resonance stands out because it provides more information about spine and spinal cord structures, having as fundamental part the acquisition of the T2 sequence, which demonstrates the contrast between the cerebrospinal fluid and the other structures. This test has shown greater reliability, especially when the presumed diagnosis is accurate, with general sensitivity and specificity of 85.5%, and even, close to 100% in inflammatory and oncological pathology[3].

The assessment has been limited to the region which is presumed to be affected, even though not all the pathologies affect only one region: the herniated discs have the lumbosacral spine as their settling zone; the spondyloarthropathies denote low back pain, with possible involvement in other segments, while vertebral haemangiomas and other neoplasms are clinically silent until they cause vertebral collapse or spinal cord compression, with greater presence at dorsal level. Therefore, some form of total assessment of the spine would be required[4].

Currently, modern magnetic resonance systems allow the assessment of the entire spine in a single sequence, which is called image or panoramic sequence. This allows obtaining images of all the axis of the spine in a sagittal plane and only requires of a few additional minutes. This acquisition does not require the repositioning of the patient; it is only planned from the acquisition console, and the time is based on what is being acquired, whether T2, T1 or STIR[5].

This technique is based on the application of the Composing software, which allows joining several sequences acquired under certain conditions –which, in the past, was only performed in the post-processing of the images – as well as automatically obtaining that image through a planning called Set and Go, which consists of programming the acquisition of the sequences of interest in a row, obtaining, then, the image immediately after. This implies a considerable optimization by the saving in the use of platforms and time in the post-processing of the image[6].

Taking into account that the T2 sequence is considered a basic pattern sequence in the spinal study, obtaining a panoramic T2 sequence is greatly helpful for the conventional study of the lumbosacral spine, due to the additional information obtained. However, there are no studies on its application in the country, although the lumbosacral spine examination is quite frequent in Magnetic Resonance services, so the results of this research would serve as a source of information and reference for its realization due to the diagnostic benefit and short realization time.

The aim of this study was to assess the usefulness of the panoramic T2 sequence in magnetic resonance imaging of the lumbosacral spine at the Clinica Internacional - San Borja, in adult patients, in 2016.

MATERIALS AND METHODS

This is a quantitative, prospective, and cross-sectional study. The population comprised 357 patients and the sample comprised 186 cases. The unit of analysis was the patient between 18 and 60 years old, attended in the doctor's office, to whom a magnetic resonance imaging (MRI) of the lumbosacral spine was performed. The data collection technique was the systematic observation and, as the instrument, the registration form, consisting of a general data sheet –since the examination request – and an analysis sheet, since the examination performed. The magnetic resonance equipment of the Clinica Internacional - San Borja, on which the research was carried out, was the MAGNETOM Aera by Siemens, of 1.5 Tesla, using the Spine 32 antennas (attached to the resonator table) and Body 18 (placed on the patient in the region of the lumbosacral spine) where the acquisition of the conventional study was made, as well as of the panoramic T2 sequence by means of the planning Set and Go, when activating the Composing software, which required 3 minutes and 37 seconds more (Figure 1).

Figure 1. Magnetic resonance in conventional study (A) and with panoramic T2 sequence.

RESULTS

The age of the patients subject to magnetic resonance imaging ranged from 18 to 60 years old, with a mean of 40 years old. 80.1% were adults (from 31 to 60 years old) and 19.9% were young adults (between 18 and 30 years old). Out of the total of individuals, 53.8% were women and 46.2% were men. Finally, 52.7% of the sample had a presumptive diagnosis of disc herniation.

In general, 5 out of the total of 186 tests performed were cases with normal diagnosis in the conventional study and also in the panoramic T2 sequence, while the remaining 181 had some type of finding in any segment of the spine. From the 181 cases mentioned, the findings by conventional study were 414 in total.

The highest percentage of findings at the lumbosacral level corresponded to degenerative diseases, with 93%. The most frequent were herniated discs, with 60%; followed by disc degenerations, with 19.5%; and the Modic changes, with 9.9%. The less frequent finding was spondylolysis, with only 0.5%. The other findings were congenital anomalies (5.3%), neoplastic pathology (1%, due to haemangiomas), inflammatory pathology (0.5%), and traumatic injuries (0.2%). The most frequent transition anomalies were lumbarizations (vertebra S1) and sacralizations (vertebra L5), which represented 50% and 36.4% within congenital anomalies. The diagnoses of herniated discs mentioned constitute 52.9% of total findings at lumbosacral spine level (consisting of protruding, extruded and migrated hernias with 20%, 21.5%, and 11.4% respectively), which occurred in 167 patients (Table 1).

Table 1. Lumbosacral spine findings with conventional magnetic resonance study.

Specific Diagnostic Findings	Type of Pathology in Lumbosacral Spine							
	Degenerative		Congenital		Neoplastic		Total	
	n	%	n	%	n	%	n	%
Protruding hernia	83	21.6%					83	20.0%
Extruded hernia	89	23.1%					89	21.5%
Migrated hernia	47	12.2%					47	11.4%
Disc degeneration	75	19.5%					75	18.1%
Modic Changes II	21	5.5%					21	5.1%
Modic Changes I	17	4.4%					17	4.1%
Other degenerative types	53	13.8%					53	12.8%
Lumbarization			11	50.0%			11	2.7%
Sacralization			8	36.4%			8	1.9%
Other congenital types			3	13.6%			3	0.7%
Haemangioma					4	100%	4	1.0%
Other pathological types							3	0.7%
Totals per Type	385	100%	22	100%	4	100%	414	100%
Absolute Total	385	93.0%	22	5.3%	4	1.0%	414	100%

In relation to the 181 cases abovementioned, findings at the cervical and dorsal level were also found by panoramic T2 sequence, which were 117 and 46, making a total of 163 findings apart from the lumbosacral segment. At the level of the cervical spine, the findings were almost entirely degenerative diseases (99.1%), being the most frequent herniated discs, with 59.5%, due to protruding, extruded and migrated hernias, which represented 58%, 39.1%, and 2.9% of the total hernias, respectively (Figure 2), followed by disc degenerations with 28.4% and verticalizations, with 10.3%. Likewise, in this segment congenital anomalies were present, comprising only 0.9%, due to the finding of hydrosyringomyelia. The herniated discs comprised 59% of findings, given by protruding, extruded and migrated hernia with 34.2%, 23.1%, and 1.7%.

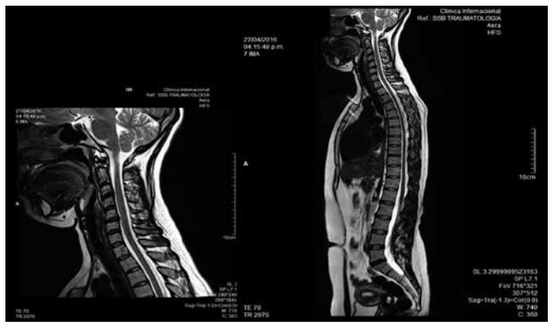
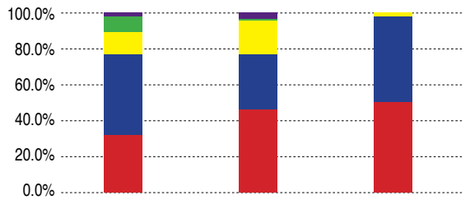


Figure 2. Magnetic resonance with panoramic T2 sequence: protruding hernia at C5-C6 disc level.

At the dorsal spine level, 81.7% of the findings were degenerative diseases: 51.7% of herniated discs, due to protruding and extruded hernias that represented 70% and 30% of the total hernias respectively (Figure 3); followed by 24.1% of cases of Schmörl nodules; and 20.7% of disc degenerations. The remaining 18.3% at the dorsal level were neoplastic pathologies, due to haemangiomas. The cases of dorsal disc hernias comprised 42.3% of total findings, consisting of protruding and extruded hernias with 29.6% and 12.7%, respectively. In this sense, the main findings apart from the lumbosacral segment were hernias, in 77 patients, and represented 59% of findings at cervical level and 42.3% of findings at dorsal level.

Figure 3. Magnetic resonance with panoramic T2 sequence: protruding hernia at D7-D8 disc level.

On the locations of the findings on lumbosacral spine, regarding its main pathology, the herniated disc, they were more frequent in the intervertebral disc L5-S1, with 42.5%, followed by the disc L4- L5 (39.7%), L3-L4 (12.3%), L2-L3 (3.2%), and L1-L2 (2.3%). The extruded and migrated hernias had as their main location the L5-S1 disc, with 44.9% and 55.1% respectively, while for protruding hernias, it was the L4-L5 disc, with 44.6% (Figure 4).



	Hernia protuida	Hernia extruida	Hernia migrada
Disco L1-L2	2.4%	3.4%	0.0%
Disco L2-L3	7.2%	1.1%	0.0%
Disco L3-L4	10.8%	19.1%	2.1%
Disco L4-L5	44.6%	31.5%	46.8%
Disco L5-S1	34.9%	44.9%	51.1%

Figure 4. Anatomical location of the lumbar disc hernias.

The usefulness of the panoramic T2 sequence was proved by hypothesis test for a proportion, considering as a null hypothesis that this allows obtaining 50% more additional findings in comparison to the conventional study. After obtaining the Pvalue of the corresponding Zcal, which considers the findings at the lumbosacral spine level through the conventional study (414) and the additional findings at the level of cervical and dorsal spine through the panoramic T2 sequence (188), the Pvalue was equivalent to 0.062, more than 0.05, that allows accepting the null hypothesis, which indicated that the panoramic T2 Sequence allows obtaining 50% more additional findings in comparison to the conventional study of Magnetic Resonance imaging of lumbosacral spine.

DISCUSSION

The results demonstrated the usefulness of the panoramic T2 sequence in the lumbosacral spine, reaffirming the importance of magnetic resonance, as stated by Ruiz[7], and that examination requests with a specific presumption justify its realization, for visualizing early changes, as Fretes[8], Millán and Cols[9], Rodríguez[10], and Pérez-Templado[11] explain. In the verification of the hypothesis, it was concluded that this sequence allows obtaining 50% more findings in comparison to the conventional study, similar to that reported by Méndez[12], which obtained 74.8% through panoramic STIR sequence by post-process, and that considered patients in the old age.

Likewise, this research supports what was proposed by Sanz[13], about the use of a sequence of 11 to 15 sagittal sections including from vertebra C1 to S2 for the evaluation of the entire axis, and also confirms what Romano et. al. said[14], regarding the image enhanced in T2 was superior for the various anomalies. In relation to this, it is confirm what Vilanova expressed[15], who indicated that the spine can be examined from acquisitions that lead to a single image; as well as what Aso and Martínez showed[16], because through the Composing software an image can be obtained to discover diseases adjacent to those of the specific segment.

Among the pathologies diagnosed, the largest number was degenerative, with 93% of findings, from which 60% were herniated discs, which coincided with Ortega's studies[17] at the Ecatepec Medical Center of the Social Security Institute, and González[18] at the National University Hospital of Colombia, where the same type of hernias were the main diagnoses with 40.2% and 33.7%, respectively. Among these hernias, a higher percentage were the extruded ones, with 40.6%, followed by protruding hernias, with 37.9%; these percentages were lower than those obtained by Ortega y González, as well as by Solano and Ávila[19] at the Hospital José Carrasco Arteaga de Cuenca of the Ecuadorian Social Security Institute, where the main diagnosis was disc protrusion, with 73.3%, 87.6%, and 96.7%, respectively.

Findings were made at the cervical and dorsal spine by the panoramic T2 sequence. In both segments, herniated discs were also the most frequent findings among degenerative diseases with 59.5% and 51.7%, respectively. This confirms that herniated discs are not only the most frequent pathology at the lumbosacral level, but also along the entire spine. Although clinically, it is in this last segment that the initial symptomatology is present due to the multiple risk factors to which there is exposure for the rhythm of life or work activity of the patient.

These analyses reaffirm the importance of lumbosacral spine resonance study for the accurate diagnosis of various findings and allow their differentiation among the different types. Degenerative pathologies are the most frequent, and this is where it is demonstrated that the application of the panoramic T2 sequence is useful to obtain a higher number of findings, especially those that affect the spine in general or those that are not contiguous, so it is important to consider the sequence as a fundamental element to obtain diagnostic information in addition to the conventional study of the magnetic resonance imaging of the lumbosacral spine.

CONCLUSIONS

In general, the research determined that the panoramic T2 sequence in the magnetic resonance examination of the lumbosacral spine is diagnostically useful for allowing obtaining 50% more additional findings in comparison to the conventional study. The main findings, both in the lumbosacral spine and the cervical and dorsal segments, corresponded to degenerative diseases. The herniated discs were the most frequent, and the mostly recurrent lumbosacral location was in the intervertebral disc L5-S1.

AID OR SOURCES OF FINANCE
None.

CONFLICT OF INTEREST
The authors do not report conflicts of interest regarding the present manuscript.

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