ENDOVASCULAR TREATMENT OF A LARGE, EMBOLIZED, UNRUPTURED CEREBRAL ANEURYSM THAT PRESENTED RECHANNELING

Tratamiento endovascular de un aneurisma cerebral no roto, grande, embolizado que presentó recanalización

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ABSTRACT

Introduction: Endovascular treatment of ruptured and non-ruptured brain aneurysms is an appropriate option in most patients. In narrow neck aneurysms, treatment with coils is sufficient, but in those with wide necks, the use of stent-assisted coils or flow diverters is necessary. Endovascular treatment of intracranial aneurysms is effective and provides complete occlusion in up to 85% of cases, however, there are cases of incomplete obliteration or recanalization that require treatment.
Clinical Case: A 79-year-old woman with a history of high blood pressure and embolization with coils of an unruptured cerebral aneurysm of the left posterior communicating artery, 5 years ago, Raymond Roy I in the immediate postoperative period. She has been presenting with right hemiparesis and III left cranial nerve palsy for 1 year. An angiotomography (angioCT) showed recanalization of the aneurysm, so it was decided to perform an embolization with coils and stents, achieving complete occlusion of the aneurysm (Raymond Roy I). In the following weeks, the patient regained strength in the right hemibody and recovered function of the III left cranial nerve.
Conclusion: Recanalization of aneurysms undergoing endovascular treatment is infrequent, less than 10%, and is associated with complex aneurysms. In these cases, the use of advanced or combined endovascular techniques is recommended to achieve total closure of the aneurysm and decrease the associated morbidity and mortality rate.

Keywords: *Intracranial Aneurysm, Endovascular Procedures, Stent, Embolization Therapeutic. (Source: MeSH NLM)*

RESUMEN

Introducción: El tratamiento endovascular de los aneurismas cerebrales rotos y no rotos es una opción adecuada en la mayoría de los pacientes. En aneurismas con cuello angosto el tratamiento con coils es suficiente, pero en los de cuello ancho es necesario el uso de coils asistidos con stent o diversor de flujo. El tratamiento endovascular de los aneurismas intracraneales es efectivo y provee una oclusión completa hasta en el 85% de los casos, sin embargo, existen casos de obliteración incompleta o recanalización que requieren tratamiento.
Caso Clínico: Mujer de 79 años, con antecedentes de hipertensión arterial, y embolización con coils de un aneurisma cerebral no roto de la arteria comunicante posterior izquierda, hace 5 años, Raymond Roy I en el posoperatorio inmediato. Acude por presentar hemiparesia derecha y ptosis palpebral izquierda desde hace 1 año. La angiotomografía (angioTEM) mostró recanalización del aneurisma, por lo que se decidió realizar una embolización con coils y stent, logrando la oclusión completa del aneurisma (Raymond Roy I). En semanas siguientes, la paciente recuperó la fuerza en hemicuerpo derecho y la función del III nervio craneal izquierdo.
Conclusión: La recanalización de aneurismas sometidos a tratamiento endovascular es poco frecuente, menor al 10%, y a esta asociada a aneurismas complejos. En estos casos, se recomienda el uso de técnicas endovasculares avanzadas o combinadas para lograr el cierre total del aneurisma y disminuir la tasa de morbilidad y mortalidad asociada.

Palabras Clave*: Aneurisma Intracraneal, Procedimientos Endovasculares, Stent, Embolización Terapéutica. (Fuente: DeCS Bireme)*

Peru J Neurosurg 2020, 2 (2): 61-65

According to American statistics, it has been estimated that between 1 to 5% of the world population may have an aneurysm and in addition 1 in 10,000 patients suffer subarachnoid hemorrhage(SAH) due to rupture of a cerebral aneurysm, making this the leading cause of non-traumatic subarachnoid hemorrhage. (spontaneous) in the United States, causing death or disability in about 18,000 to 20,000 people a year. [1, 2, 3] Although traumatic subarachnoid hemorrhage is the most frequent cause, it is known that, of

Submitted *: March 10, 2020*
Accepted *: March 28, 2020*
HOW TO CITE THIS ARTICLE*:* Espinoza Y, Vargas J, Rodríguez R, Durand W, Valer D, Flores-Q J, Saal-Zapata G. Endovascular treatment of a large, embolized, unruptured cerebral aneurysm that presented rechanneling. *Peru J Neurosurg 2020; 2(2): 61-65*

the non-traumatic causes, 80% correspond to the rupture of saccular aneurysms that are preferably located in the anterior communicating artery. [4]

Endovascular treatment of ruptured and unruptured brain aneurysms is an appropriate option for the treatment of most patients. For those aneurysms that have a well-defined and narrow neck, treatment with coils is sufficient. On the other hand, when the neck is wide, other strategies are chosen, such as stent-assisted coils or flow diversion. [5]

Endovascular treatment of intracranial aneurysms is effective and provides complete occlusion in most cases, however, there are cases of incomplete obliteration or recanalization that require treatment. The case of a patient with a large AComP aneurysm previously embolized and who showed recanalization is presented. She was successfully treated endovascularly at the Neuroradiology Service of the Almenara Hospital.

CLINICAL CASE

History and examination: A 79-year-old female patient from Pasco, with a history of high blood pressure and embolization of a large, unruptured aneurysm (16.5x7.9mm) of the posterior communicating artery (5 years ago). Embolization was performed using 7 coils (Microplex® 16mmx30cm, Helical Mycrocoil® 9mmx20cm, Helical Target® 360 16mmx50cm, Hydrocoil 14® 7mmx20cm, Microplex 10® 9mmx30cm, Hydroframe 10® 7mmx28cm) and the result in the postoperative angiographic control was a Raymond Roy I embolization.

One year ago, the patient presented mild right hemiparesis, associated with left palpebral ptosis; Control cerebral angiotomography (angioCT) showed recanalization of the embolized aneurysm of the left posterior communicant. A posterior cerebral panangiography showed growth of the recanalized aneurysm, with compaction of the coils at the bottom of the aneurysm, which according to Yu's classification corresponded to type II, and being a large aneurysm and due to a vascular steal phenomenon, it caused a clinical picture (Figure 1).

Endovascular Treatment: It was decided to embolize a second time, using the coiling and stenting technique. First, a PX Slim ® microcatheter assisted with the Traxcess 14 ® microguide was placed to the aneurysm dome where it was embolized with 12 coils: Complex® 18mmx57cm, Complez® 18mmx57cm, Complex® 15mmx57cm, Complex® 12mmx45cm, Complex® 13mmx48cm, Complex ® 13mmx48cm, Complex ® 10mmx30cm, Complex® 10mmx30cm, Complex® 9mmx35cm, Complex ® 10mmx 30cm, Complex® 10mmx30cm. Then using another microcatheter, PX Slim® assisted with the Traxcess 14® microguide was navigated until it was placed equidistant from the aneurysm neck and a 4.5x23mm LVIS ® stent was detached. An angiographic control was then performed, showing adequate compaction of the coils inside the aneurysm, without showing a residual neck (Figure 2).

Clinical evolution: In the immediate postoperative period, a control brain tomography was performed, where no evidence of complications of the procedure was found (Figure 3). The patient progressively had a good clinical evolution, presenting remission of the motor deficit produced by the vascular steal phenomenon, in addition to resolution of the paresis of the III left cranial nerve, achieving almost total recovery with the support of physical therapy.

DISCUSSION

Endovascular treatment is effective in the management of intracranial aneurysms and provides complete occlusion for up to 85% of patients, reducing bleeding and rebleeding rates. The expansion of endovascular therapy has allowed us to identify an increase in incomplete obliteration of aneurysms, remaining neck, and recurrence of aneurysms, which should be treated. [8]

In some complex aneurysms, despite endovascular treatment, there were high rates of incomplete occlusion, recanalization, or retreatment with microsurgical clipping, so that the technology of the coils has changed in the last 2 decades. [6]

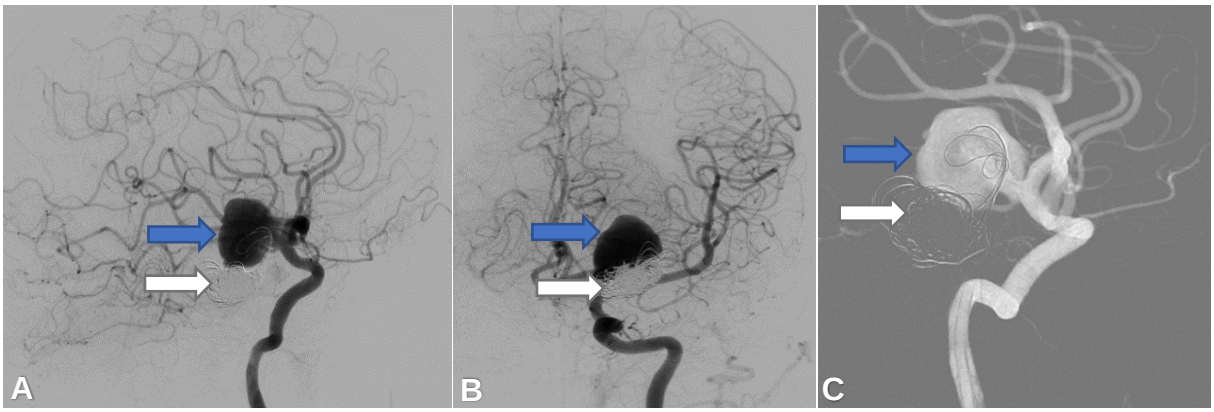

Fig 1. (A) Cerebral angiography of the left internal carotid (ICA) in lateral view showing a recanalized aneurysm (blue arrow) and in the background the compacted coils (white arrow) are observed. **(B)** Cerebral angiography of the left ICA in anteroposterior view, with recanalized aneurysm (blue arrow) and compacted coils at the bottom of the aneurysm (white arrow). **(C)** Roadmap in lateral view of the left ICA showing recanalized aneurysm (blue arrow) and packed coils at the bottom of the aneurysm (white arrow).

Complex aneurysms are a heterogeneous group of cerebral vascular malformations; their complexity may be related to size, difficult location, wide neck, perforating branches close to the aneurysm, wall structure, calcifications, presence of intraluminal thrombus or previous ineffective treatment. Given this, the neurosurgeon must make use of more complex endovascular techniques to decrease the recanalization rate. [7]

The original or modified Raymond classification is a well-known classification system for viewing the initial results of an embolization, but there is insufficient information on the morphological changes in aneurysmal recurrence. For this reason, Yu's classification focuses on the compaction of the coils and growth after embolization. Thus, there are 5 types: (I) recurrent aneurysm due to recanalization within packaged coils, (II) recurrent aneurysm due to recanalization of the neck or sac, without aneurysm growth, with compaction towards the bottom of the aneurysm, (III) new aneurysm neck without adequate aneurysm compaction of the sac and neck previously, (IV) new aneurysm neck with adequate aneurysm compaction of the sac and neck previously , (V) a new aneurysm sac originating from the initial aneurysm neck, irregularly shaped, with or without adequate compaction of coils previously. [8]

Ogllvy et, al mentioned in his study that the size of the aneurysm, its rupture state, the use of stents in embolization and the degree of aneurysmal occlusion after treatment are factors independently associated with the need for retreatment. He created a score, which gives 2 points to an aneurysmal size greater than 10mm, 2 points for being ruptured, 2 points for the presence of intraluminal thrombus, - 1 for using a stent, -2 for using a flow diverter , 1 point to a Raymond Roy II, 2 points to a Raymond Roy III, finally being able to have a range from -2 to +8, having a statistically significant relationship to a higher score, with

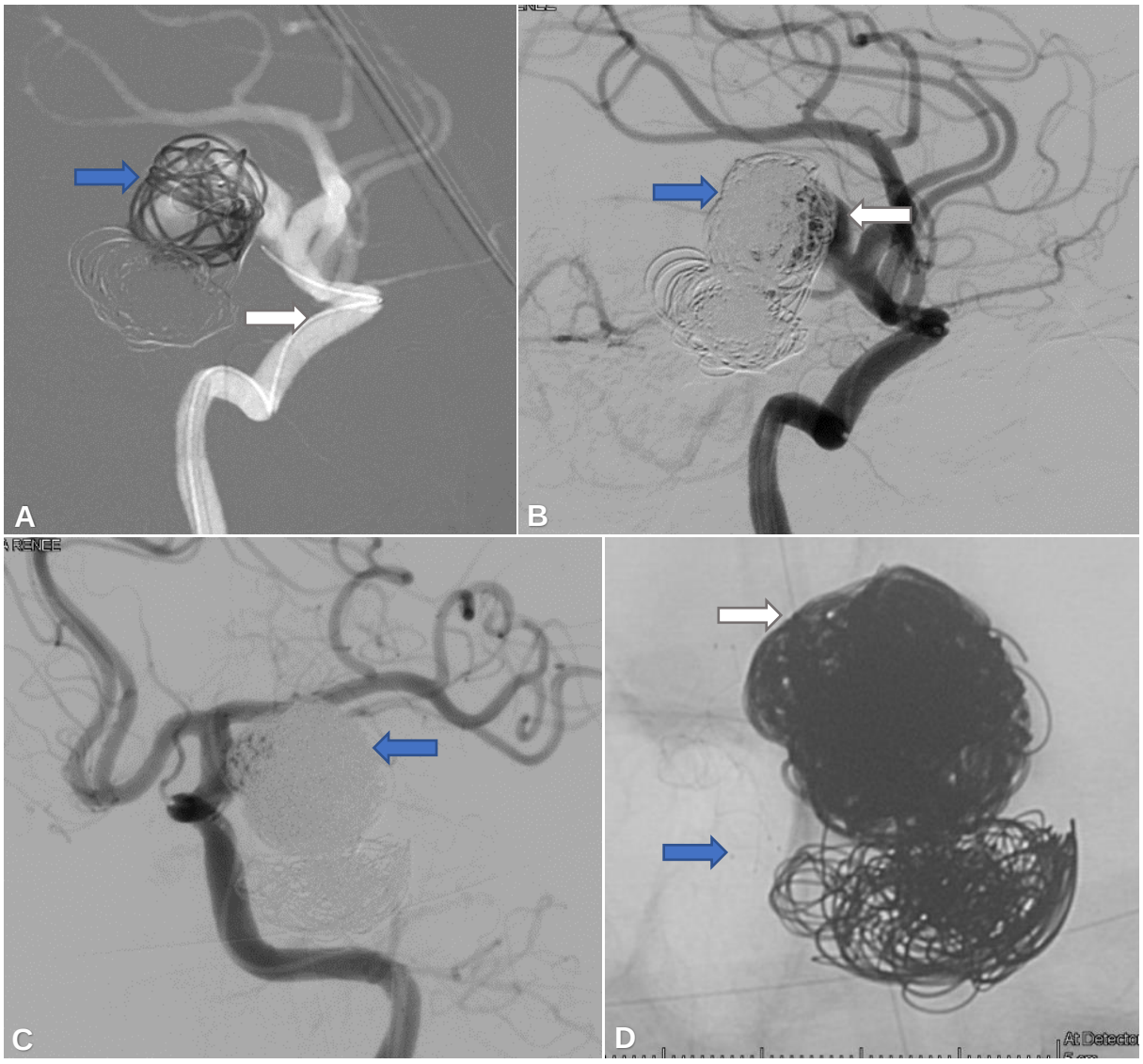

Fig 2. (A) Roadmap of the left ICA in lateral view, where a new coil (blue arrow) is evident in the recanalized aneurysm and the microcatheter that is being used to embolize (white arrow). **(B)** Cerebral angiography of the left ICA in a lateral view showing adequate coil compaction in the recanalized aneurysm (blue arrow) and a small residual neck (white arrow). **(C)** Cerebral angiography of the left ICA in anteroposterior view where adequate compaction of coils is evident in the recanalized aneurysm (blue arrow), finally resulting in Raymond Roy type I. **(D)** Fluoroscopy of the left ICA in the anteroposterior view. recanalized aneurysm with adequate coil compaction (white arrow) and the stent that was placed in the carotid (blue arrow).

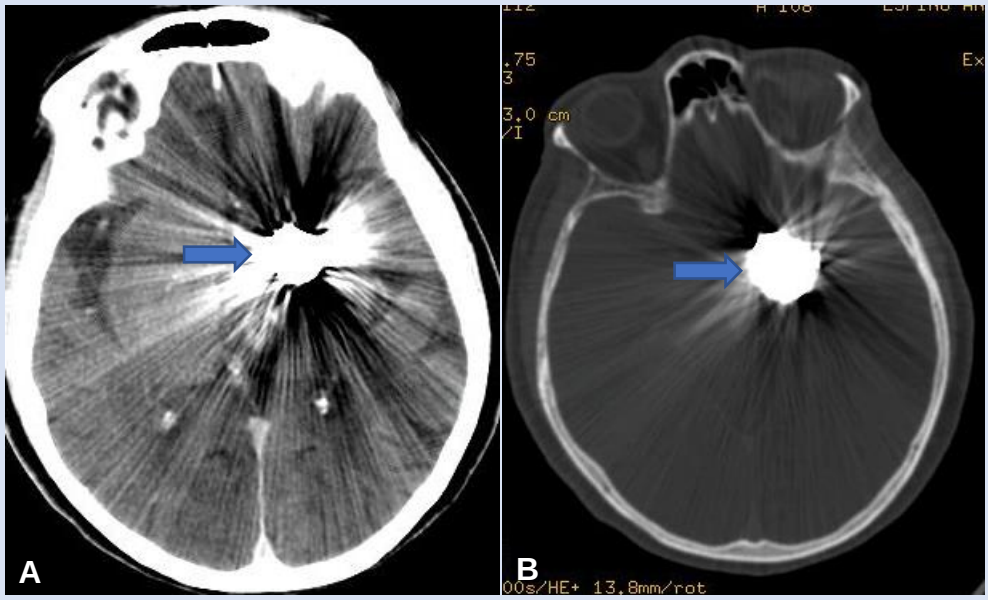

Fig 3. (A) Cerebral tomography (CT) without contrast in axial section and parenchymal window, showing embolization material (blue arrow) in the territory of the left posterior communicating artery, in great quantity that generates a lot of artifact, but despite it is not show signs of acute complications. **(B)** Brain CT without contrast in axial section and bone window, where it is show embolization material (white arrow) with less artifact, the location of which was a large aneurysm of the left posterior communicating artery.

the consequent need for retreatment of the aneurysm. [9]

Yu et al, on the other hand, mentioned in his study a classification of the type of aneurysm recanalization and he was able to observe that type I and II aneurysms have high occlusion rates and a good long-term prognosis, with additional endovascular treatment. While types III to V tend to regenerate and recur after additional endovascular treatment, for which reason this author suggests additional microsurgical treatment in these cases. [8]

Aneurysm recurrence is associated with risk of rebleeding, so the retreatment is recommended. Microsurgical treatment brings the risk of complications from the procedure due to the difficulty of the technique. Li et al, in their study, observed from January 2002 to January 2013, 43 patients with recurrence of aneurysm after microsurgical treatment, who were treated by coiling, achieving total occlusion in 84% of patients. [10]

Lawton et al, presents a meta-analysis where it was observed that, of the patients undergoing endovascular treatment, 12.3% required endovascular retreatment. But Lawton also mentions that microsurgical retreatment has a higher mortality rate than endovascular treatment. [11]

The management of recurrence of embolized intracranial aneurysms considers the use of more complex endovascular techniques such as remodeling (balloon with coils), the concomitant use of coils and stents, and the use of flow diversor. Likewise, the use of coils of different configurations decreases the recanalization rate, such as Penumbra coils (thicker) or hydrocoils (increase in size in contact with blood), since in large or giant aneurysms the amount of coils to be used to occlude the entire aneurysm is much larger. [8]

Our case was a recanalized aneurysm, which showed immediate occlusion of the aneurysm in the immediate postoperative control CT, but due to the force of the blood flow, coils were compacted at the bottom of the aneurysm, creating a new aneurysm again. Therefore, after analyzing the case, it was decided to coiling the aneurysm again, but now with the support of a stent, which would generates a certain redistribution of flow and a higher rate of occlusion and cure of the aneurysm. The procedure was successful, firstly, we managed to put the coils in the right place, and we verify they are adequately compacted without an aneurysm or residual neck, and secondly, we placed a stent to decrease the recurrence rate, with good clinical evolution and resolution of the symptoms.

CONCLUSION

Recanalization of aneurysms previously subjected to endovascular treatment is infrequent and less than 10% and is associated with complex aneurysms; in which cases, complex or complementary endovascular techniques must be used in order to achieve total closure of the aneurysm, and have low mortality and associated mortality rates

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Disclosures
The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Authors Contributions
Conception and design: All authors. *Drafting the article:* Espinoza, Vargas. Critically revising the article: Rodriguez. *Reviewed submitted version of manuscript:* Vargas. *Approved the final version of the manuscript on behalf of all authors:* Vargas.

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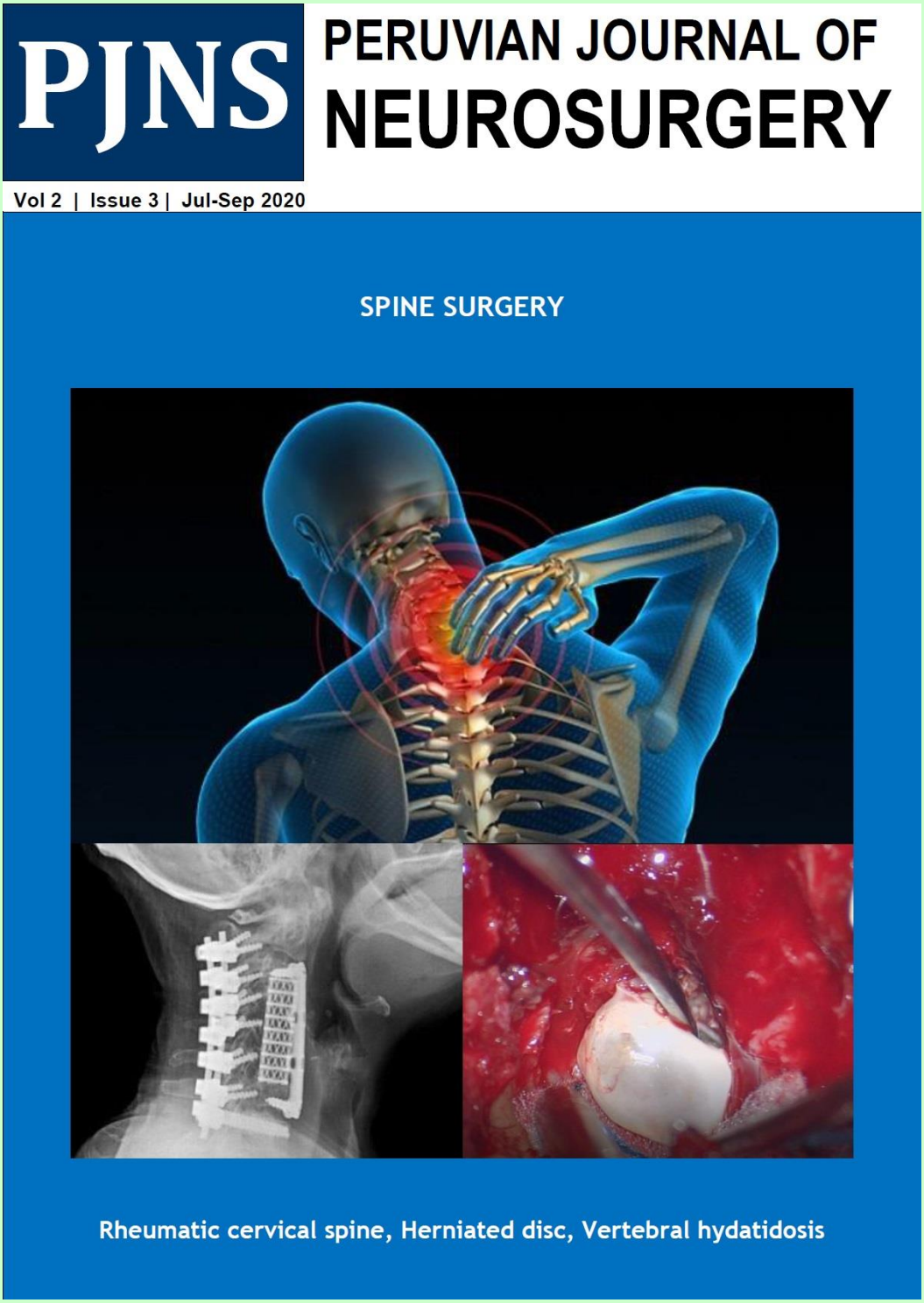
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PERUVIAN JOURNAL OF NEUROSURGERY
Vol 2 | Issue 3 | Jul-Sep 2020
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