DISTRIBUTION PATTERN OF ANASTOMOTIC VEINS OF LABBÉ AND TROLARD CONSIDERING THE LATERALITY AND SEX: AN ANGIOGRAPHIC STUDY

PADRÃO DE DISTRIBUIÇÃO DAS VEIAS ANASTOMÓTICAS DE LABBÉ E TROLARD EM FUNÇÃO DA LATERALIDADE E SEXO: UM ESTUDO ANGIOGRÁFICO

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ABSTRACT

INTRODUCTION: The superior (of Trolard; SAV) and inferior (of Labbé; IAV) anastomotic veins connect the middle cerebral vein to the superior sagittal and transverse sinuses, respectively. They are important for neurosurgery due to the high risk of injuries and the location in topographies of constant access. Consequences of injuries in SAV and IAV include cerebral edema, venous infarction, and hemorrhage. **AIM:** To investigate the distribution pattern of SAV and IAV in cerebral arteriographies considering the laterality and sex in cerebral arteriographies. **METHODS:** This cross-sectional and retrospective study was conducted at the Faculty of Medicine of Olinda. Twenty angiographies were analyzed as a pilot study for greater samples. Angiographies with lateral, oblique, and anteroposterior incidence angles and with a clear view of the cerebral venous anatomy were included. Data was analyzed using descriptive statistics. **RESULTS:** The IAV was prevalent on the right in females and the left in males. Meanwhile, the SAV was prevalent on the right in females. **CONCLUSION:** The present study described the distribution pattern of IAV and SAV considering the laterality and sex, relating to potential complications secondary to iatrogenic venous injury, which demonstrates the importance of knowing vascular structures and their neurosurgical implications.

Keywords: Cerebral veins; vein of Trolard; vein of Labbe; anatomical variations; neurosurgical anatomy.

RESUMO

INTRODUÇÃO: As veias anastomóticas superior (de Trolard) e inferior (de Labbé) são responsáveis por comunicar a veia cerebral média aos seios sagital superior e transverso, respectivamente. Elas são relevantes na área da neurocirurgia, pois são veias de alto risco para lesões em cirurgias devido à localização em topografias de acesso constante. Na literatura, são mostradas as consequências do acometimento dessas veias durante cirurgias, o que inclui edema cerebral, infarto venoso e hemorragia, dentre outras intercorrências. OBJETIVO: Investigar o padrão de distribuição da veia anastomótica de Labbé (VAL) e da veia anastomótica de Trolard (VAT) em exames de arteriografia cerebral em função da lateralidade e do sexo. MÉTODOS: Este projeto foi desenvolvido na Faculdade de Medicina de Olinda. Tratou-se de um estudo do tipo transversal, observacional e retrospectivo. Foram analisados 20 exames de angiografia como guantitativo inicial, tornando este trabalho um estudo piloto para análises posteriores com amostras mais significativas. Foram incluídos exames de arteriografias com avaliação da drenagem venosa do cérebro e excluídos os exames de arteriografia cerebral que não possuíam as três incidências utilizadas no exame. Para a análise dos dados, foi utilizada estatística descritiva de acordo com cada objetivo proposto. **RESULTADOS:** A VAL foi mais prevalente à direita no sexo feminino, enguanto no sexo masculino foi mais prevalente à esquerda. A VAT foi mais prevalente à direita no sexo masculino, enquanto



ARTICLES

no sexo feminino foi mais prevalente à esquerda. **CONCLUSÃO:** O presente estudo descreveu o padrão de distribuição das VAL e VAT em função da lateralidade e do sexo, relacionando os achados com potenciais complicações secundárias à lesão venosa iatrogênica, demonstrando a importância do conhecimento da anatomia destas estruturas vasculares e suas implicações cirúrgicas.

Palavras-chaves: Veia cerebral; veia de Trolard; veia de Labbé; variações anatômicas; anatomia neurocirúrgica.

INTRODUCTION

The superior anastomotic vein (of Trolard; SAV) and the inferior anastomotic vein (of Labbé; IAV) connect the middle cerebral vein to the superior sagittal and transverse sinuses, respectively. These anastomotic veins are at high risk of injuries due to their location in constantly accessed topographies in neurosurgery¹.

The consequences of injuries in SAV and IAV include cerebral edema, venous infarction, hemorrhage, and ischemic complications in the central region of the cerebral hemisphere and temporal lobe. Additionally, thrombosis after prolonged or forced retraction is demonstrated, highlighting the importance of anatomical understanding ^{1,2}.

A study using computed tomography observed distinct patterns of venous drainage due to insufficient venous flow regarding SAV and IAV, calling neurosurgeons to assess patterns of venous drainage^{3,4}.

Considering the high prevalence of anatomical variations in blood vessels, knowledge is crucial to the execution of surgical procedures, which provide information for radiological evaluations. Therefore, the present study aimed to investigate distribution patterns of SAV and IAV in cerebral arteriographies considering the laterality and sex.

METHODS

This study was conducted at the Faculdade de Medicina de Olinda and comprised the analysis of 20 cerebral digital angiography. The inclusion criteria were angiographies with lateral, oblique, and anteroposterior incidence angles and a clear view of the cerebral venous anatomy.

This cross-sectional and retrospective study was conducted between April 2021 and April 2022 with a convenience sample. Angiographies were selected, and the angioarchitecture of the deep cerebral venous system was analyzed using the Radiant DICOM software (Medixant, Greater Poland/Poland). Numbers of SAV and IAV were assessed considering the laterality and sex.

Data were analyzed using descriptive statistics by the Statistical Package for the Social Sciences (SPSS), version 17.0 (IBM Corp., NY/USA). This study was approved by the research ethics committee of the Medicine School of Olinda (no. 43998421.0.0000.8033).

RESULTS

Cerebral arteriographies presented 92.86% of the IAV and 50.00% of the SAV on the right. On the left, the IAV was observed in 92.86% and SAV in 64.29% of participants. Thus, the IAV did not show statistical difference between sides, whereas the SAV was significantly more prevalent on the left.

The prevalence of IAV and SAV in female participants on the right was 100% and 37.50%, respectively. On the left, the prevalence was 87.50% for the IAV and 75.00% for SAV. Data indicated an increased prevalence of the IAV on the right and the SAV on the left.

Regarding male participants, the prevalence of IAV and SAV on the right was 83.33% and 66.67%, respectively. On the left, the prevalence was 100% for IAV and 50.00% for SAV. Data indicated a greater prevalence of the IAV on the left and the SAV on the right.

The pattern of anastomotic veins was the opposite regarding sexe. While the IAV was prevalent on the right in females and the left in males, the SAV prevailed on the left in females and on the right in males.

In summary, the IAV was more prevalent (100.00%) on the right in females and the left

in males. Conversely, the SAV was more prevalent on the left in females (75.00%) and on the

right in males (66.67%) (Figure 1).



Figure 1. Distribution of anastomotic veins of Labbé and Trolard considering the laterality and sex.

DISCUSSION

Neurological consequences due to injuries to IAV and SAV during surgeries are documented in the literature, such as cerebral edema, venous infarction, hemorrhage, and ischemic complications in the central region of the cerebral hemisphere and temporal lobe. In addition, thrombosis may occur after prolonged or forced retraction of the IAV^{2,3,7}.

A study using computed tomography described distinct patterns of venous drainage based on impaired venous flow involving IAV and SAV⁴. Therefore, the present study aimed to analyze and associate these patterns considering the laterality and predominance between sexes. This highlights the importance and originality of the study, allowing a new approach with detailed information and analyses.

The main patterns observed in the previous study were (i) absence of connection between IAV, SAV, and the superficial middle cerebral vein; (ii) double connection (superficial middle cerebral vein connected to the IAV, superficial middle cerebral vein connected to the SAV, and connection between IAV and SAV); and (iii) triple connection (all three veins connected)⁴. Considering these results, the present study focused on differences between laterality and sexes.

Furthermore, findings observed during arteriog-

raphy analysis were the absence of predominance between the right and left sides regarding the IAV and the prevalence of the SAV on the left. Additionally, the IAV was prevalent on the right and the SAV on the left in females; in males, the opposite was observed, the IAV was prevalent on the left and the SAV on the right.

The prevalence of IAV and SAV was accessed in a study using magnetic resonance, which showed prevalence of the IAV, followed by the middle cerebral vein and the SAV. However, the simultaneous presence of the three veins was higher than the presence of the IAV alone. Comparing these data with the arteriography analysis reaffirmed the prevalence of the IAV in exams and in both sexes, which reinforced the high risk of injuries during neurosurgical procedures⁵.

The proportion of IAV and SAV corroborates the literature. However, the number of arteriographies did not allow for an inferential statistic, and a larger sample is suggested for significance tests.

This analysis reinforces the importance of pre-surgical mapping of IAV and SAV, considering the laterality and sex. These measures might reduce the risk of venous congestion or infarction due to surgical maneuvers that may cause vein stretching or stenosis. Those benefits mainly concern the IAV, the most frequent-

ARTICLES

ly injured vein in neurosurgeries. Such injuries include permanent lesions leading to aphasia, hemiplegia, disorientation, loss of consciousness, and death, enhancing the necessity for neurosurgeons to evaluate patterns of venous drainage, highlighting the relevance of the present study^{6,8}.

CONCLUSION

Studies on the superficial cerebral venous system lack attention in the neurosurgery area. An extensive literature review showed limited systematic description and numeric distribution of IAV and SAV. Thus, the present study aimed to provide data for the practical planning of surgical procedures, presenting a systematic description and numeric distribution of IAV and SAV and the main differences between laterality and sex, using cerebral arteriography. Understanding the unique pattern of venous drainage present in each individual should be considered during the planning of neurosurgeries.

This study also described possible secondary complications due to venous iatrogenic lesions, which may impair the blood supply in brain regions and cause cerebral ischemic events.

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