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ADVANCEMENTS IN SPINAL HEMANGIOMA DIAGNOSIS AND TREATMENT: A COMPREHENSIVE OVERVIEW

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Abstract. The diagnosis and treatment of spinal hemangiomas have witnessed significant advancements in recent years, owing to the enhanced capabilities of modern neuroimaging techniques. Hemangiomas, benign tumors originating from newly formed blood vessels, constitute a notable subset of spinal neoplasms, accounting for 2-3% of all cases. This paper traces the historical trajectory of understanding spinal hemangiomas, highlighting seminal works by early researchers such as U. Hunter and Virchow. Epidemiological data reveal a distinct distribution pattern, with the thoracic region being the most commonly affected. Advanced imaging modalities, particularly MRI and CT scans, play a pivotal role in precise tumor characterization, crucial for treatment planning [2,5]. The introduction of puncture vertebroplasty in 1984 by P. Galibert and H. Deramon marked a significant breakthrough in the therapeutic landscape, offering a minimally invasive yet highly effective treatment option for aggressive spinal hemangiomas. Moving forward, collaborative efforts among healthcare professionals are essential to further refine diagnostic and treatment strategies, ultimately improving patient outcomes and advancing the field of spinal hemangioma management.

Key words: spinal hemangioma, MRI, CT

Introduction. In recent years, the diagnosis and treatment of spinal hemangiomas have undergone notable advancements, primarily driven by the refinement of neuroimaging techniques such as Magnetic Resonance Imaging (MRI) and Computed Tomography (CT). Hemangiomas, characterized by benign tumors originating from newly formed blood vessels, represent a significant subset of spinal neoplasms, accounting for approximately 2-3% of all cases [4,12,15]. The journey of understanding spinal hemangiomas traces back to pivotal works by early researchers such as U. Hunter and Virchow, which laid the groundwork for contemporary insights into their epidemiology, diagnosis, and treatment. Despite historical origins, recent advancements in diagnostic modalities have revolutionized the landscape, enabling precise tumor characterization and tailored treatment approaches [19,21,24].

Epidemiology and Localization: epidemiological studies reveal a distinct distribution pattern of spinal hemangiomas within the vertebral column, with the thoracic region emerging as the most commonly affected site (60-76%), followed by

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the lumbar region (22-29%), and less frequently, the cervical region (2-11%) and sacrococcygeal departments (<1%). Typically, a single vertebra bears the brunt of the affliction [1,8,27], with the tumor primarily affecting the vertebral body and, sporadically, extending into the arch. On average, presentation occurs around the age of 40, with a slight female predominance (3:2 ratio) [13,16,22]. These epidemiological insights underscore the importance of tailored diagnostic and therapeutic approaches based on tumor localization and patient demographics.

Diagnostic Advancements and Clinical Implications: the advent of modern imaging modalities, particularly MRI and CT scans, has revolutionized the diagnostic paradigm of spinal hemangiomas. Pathoanatomical studies have revealed a prevalence of 10.7%, underscoring the critical role of comprehensive imaging in their detection. Unlike in the past, where the distinction between aggressive and non-aggressive variants was challenging pre-compression fracture, contemporary diagnostic protocols rely on advanced imaging for precise characterization [17,28]. MRI and CT complement each other seamlessly, providing a nuanced assessment of tumor characteristics, pivotal in determining aggressiveness and subsequent treatment planning. These diagnostic advancements have translated into improved clinical outcomes and enhanced patient care, with tailored treatment strategies based on individual tumor characteristics.

Puncture Vertebroplasty. A Therapeutic Breakthrough: a watershed moment in the therapeutic landscape of aggressive spinal hemangiomas emerged with the introduction of puncture vertebroplasty in 1984 by French neurosurgeon P. Galibert and neuroradiologist H. Deramon. This minimally invasive technique involves puncturing the affected vertebra and injecting radiopaque bone cement, effectively arresting tumor growth and stabilizing the vertebral body [23,27]. Puncture vertebroplasty has since emerged as the cornerstone of treatment for aggressive spinal hemangiomas, offering both therapeutic efficacy and tangible clinical improvement. The integration of puncture vertebroplasty into treatment algorithms represents a significant stride in improving outcomes for patients with aggressive tumors, offering a minimally invasive yet highly effective approach.

Future Directions and Conclusion: the management of spinal hemangiomas continues to undergo refinement, driven by ongoing advancements in diagnostic imaging and therapeutic interventions. Collaborative efforts among healthcare professionals are paramount in addressing the evolving challenges posed by spinal hemangiomas and advancing patient care to unprecedented levels of excellence [18,20,26]. Moving forward, further research is imperative to refine diagnostic criteria, optimize treatment strategies, and enhance long-term outcomes. By leveraging interdisciplinary collaborations and embracing technological innovations, the field of

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spinal hemangioma management holds promising prospects for continued advancement and improved patient outcomes.

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