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Study Of Role Of Digital Subtraction Angiography In Peripheral Vascular Malformations.

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ABSTRACT

Peripheral vascular malformations (PVMs) present significant diagnostic and therapeutic challenges due to their complex anatomy and varied clinical manifestations. Digital subtraction angiography (DSA) offers high-resolution imaging and real-time assessment, making it a crucial tool in the management of PVMs. This study aimed to evaluate the role of DSA in the diagnosis and management of peripheral vascular malformations in a clinical cohort. A retrospective study was conducted involving 20 patients diagnosed with PVMs who underwent DSA. Demographic data, clinical presentations, DSA findings, and management outcomes were analyzed. The interventions included endovascular embolization, surgical resection, and conservative management. The study included 12 males and 8 females, predominantly aged 18-40 years (50%). Clinical presentations varied, with pain (70%) and swelling (50%) being most common. DSA identified arterial malformations in 40%, venous malformations in 35%, and mixed arteriovenous malformations in 25%. Endovascular embolization was performed in 50% of cases, with a 75% improvement rate in symptoms. Complications detected included thrombosis (15%) and hemorrhage (10%). DSA is an invaluable tool for diagnosing and managing PVMs, providing detailed vascular imaging and guiding effective therapeutic interventions. The high success rate of endovascular treatments highlights its clinical utility in improving patient outcomes.

Keywords: Digital subtraction angiography, peripheral vascular malformations, endovascular embolization

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INTRODUCTION

Peripheral vascular malformations (PVMs) are a diverse group of congenital vascular anomalies involving arteries, veins, capillaries, or lymphatics, often presenting significant diagnostic and therapeutic challenges [1]. These malformations can result in a range of clinical manifestations, from asymptomatic lesions to severe complications such as pain, bleeding, ulceration, and functional impairment. The accurate diagnosis and characterization of PVMs are crucial for guiding appropriate treatment strategies and improving patient outcomes [2, 3].

Digital subtraction angiography (DSA) is a pivotal imaging technique in the evaluation of peripheral vascular malformations. It provides high-resolution images and detailed visualization of vascular structures, allowing precise assessment of the anatomy, hemodynamics, and extent of the malformation. Unlike other imaging modalities, DSA offers real-time imaging and the capability to perform therapeutic interventions concurrently. This dual diagnostic and therapeutic potential makes DSA an invaluable tool in the management of PVMs [4-6].

Despite advancements in non-invasive imaging techniques such as Doppler ultrasound, CT angiography, and MR angiography, DSA remains the gold standard for comprehensive evaluation. Its role extends beyond mere visualization, facilitating endovascular treatments such as embolization. Our study aims to elucidate the role of DSA in the diagnosis and management of peripheral vascular malformations, emphasizing its significance in clinical practice and potential benefits in patient care.

STUDY METHODOLOGY

Our retrospective study was conducted at a tertiary care hospital, involving a sample size of 20 patients diagnosed with peripheral vascular malformations. All patients underwent digital subtraction angiography (DSA) as part of their diagnostic workup. Inclusion criteria comprised patients of all age groups with clinically suspected or previously diagnosed peripheral vascular malformations. Exclusion criteria included patients with contraindications to DSA, those who had undergone prior surgical interventions, and individuals with incomplete medical records.

The digital subtraction angiography procedures were performed using a standardized protocol. Patients were positioned on the angiography table, and local anesthesia was administered at the access site. A catheter was introduced through the femoral artery using the Seldinger technique, and selective angiography of the affected vascular region was carried out. Contrast media were injected to enhance the visualization of the vascular structures, and real-time images were captured and digitally subtracted to produce high-resolution images. The images were analyzed to assess the anatomy, hemodynamics, and extent of the malformations, and any associated complications.

Data were collected retrospectively from the patients' medical records, including demographic details, clinical presentations, DSA findings, and subsequent management strategies. The effectiveness of DSA in diagnosing and guiding the treatment of peripheral vascular malformations was evaluated based on the correlation between angiographic findings and clinical outcomes. Statistical analysis was performed to determine the significance of the results, and the data were presented in descriptive statistics, including mean, standard deviation, and percentages. The study adhered to ethical standards, with institutional review board approval and patient consent obtained for the use of medical records for research purposes.

RESULTS

Table 1: Demographic Details of Patients

Parameter	Number (n=20)	Percentage (%)
Age Group		
< 18 years	4	20%
18-40 years	10	50%
> 40 years	6	30%
Gender		
Male	12	60%
Female	8	40%

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Table 2: Clinical Presentations

Clinical Presentation	Number (n=20)	Percentage (%)
Pain	14	70%
Swelling	10	50%
Ulceration	6	30%
Bleeding	5	25%
Functional Impairment	8	40%
Asymptomatic	2	10%

Table 3: DSA Findings

DSA Findings	Number (n=20)	Percentage (%)
Arterial Malformations	8	40%
Venous Malformations	7	35%
Mixed (Arteriovenous) Malformations	5	25%
Extent of Malformation		
Localized	12	60%
Diffuse	8	40%
Complications Detected		
Thrombosis	3	15%
Hemorrhage	2	10%

Table 4: Management and Outcomes

Management Strategy	Number (n=20)	Percentage (%)
Endovascular Embolization	10	50%
Surgical Resection	6	30%
Conservative Management	4	20%
Clinical Outcome		
Improved	15	75%
No Change	3	15%
Worsened	2	10%

DISCUSSION

Our study aimed to evaluate the role of digital subtraction angiography (DSA) in the diagnosis and management of peripheral vascular malformations (PVMs) in a cohort of 20 patients. The findings underscore the significance of DSA in providing detailed visualization of vascular anomalies, guiding therapeutic interventions, and improving clinical outcomes. This discussion synthesizes the results and contextualizes them within the existing body of literature, highlighting the clinical implications and potential avenues for further research [7].

Demographic Details

The study cohort comprised 20 patients, with a slightly higher prevalence of males (60%) compared to females (40%). The age distribution indicated that the majority of patients (50%) were in the 18-40 years age group, followed by those above 40 years (30%) and those below 18 years (20%). This demographic pattern aligns with previous studies that have reported a higher incidence of vascular malformations in young to middle-aged adults. The gender distribution, with a male predominance, is also consistent with existing literature, although some studies have reported a more balanced gender ratio.

Clinical Presentations

The clinical presentations of the patients were varied, with pain being the most common symptom (70%), followed by swelling (50%), functional impairment (40%), ulceration (30%), and bleeding (25%). A small proportion of patients (10%) were asymptomatic. These findings are in line with the heterogeneous nature of PVMs, which can present with a wide spectrum of symptoms depending on the type, location, and extent of the malformation. The high incidence of pain and swelling reflects the common inflammatory and obstructive phenomena associated with vascular anomalies. Functional

impairment and ulceration are indicative of more advanced or complex malformations, often requiring more aggressive interventions [8].

DSA Findings

DSA findings revealed a diverse range of vascular anomalies, with arterial malformations being the most prevalent (40%), followed by venous malformations (35%) and mixed arteriovenous malformations (25%). This distribution is reflective of the complex vascular anatomy involved in PVMs. DSA's ability to delineate the precise anatomy and hemodynamics of these malformations is invaluable in guiding treatment decisions. The study also found that 60% of the malformations were localized, while 40% were diffuse. This distinction is crucial, as localized malformations are often more amenable to targeted interventions such as embolization or surgical resection, whereas diffuse malformations pose greater therapeutic challenges.

Complications detected through DSA included thrombosis (15%) and hemorrhage (10%). These complications underscore the importance of thorough vascular evaluation in patients with PVMs, as timely identification and management of such complications can prevent significant morbidity. The ability of DSA to detect these complications in real time enhances its clinical utility, particularly in planning and executing endovascular procedures.

Management and Outcomes

The management strategies employed in this study included endovascular embolization (50%), surgical resection (30%), and conservative management (20%). The choice of treatment was guided by the DSA findings, highlighting the integral role of DSA in therapeutic planning. Endovascular embolization was the most commonly performed intervention, reflecting its minimally invasive nature and effectiveness in controlling symptoms and reducing the size of malformations. Surgical resection was reserved for cases where embolization was not feasible or in instances of localized malformations amenable to surgical removal. Conservative management was adopted for patients with asymptomatic or minimally symptomatic malformations, where the risks of intervention outweighed the potential benefits [9, 10].

The clinical outcomes were favorable, with 75% of patients reporting improvement in symptoms, 15% experiencing no change, and 10% noting worsened conditions. These outcomes demonstrate the efficacy of DSA-guided interventions in managing PVMs. The high rate of symptom improvement highlights the effectiveness of targeted treatments, particularly endovascular embolization, in providing symptomatic relief and improving quality of life. The small proportion of patients with worsened conditions underscores the inherent challenges and complexities associated with treating vascular malformations, particularly those with diffuse involvement or complications such as thrombosis and hemorrhage.

Comparison with Existing Literature

The results of this study are consistent with the broader literature on the role of DSA in managing PVMs. Several studies have demonstrated the superiority of DSA in providing detailed vascular imaging and facilitating endovascular treatments. The findings regarding the prevalence of different types of malformations and the clinical presentations align with previous research, reinforcing the notion that PVMs are a heterogeneous group of conditions requiring individualized diagnostic and therapeutic approaches [11, 12].

The high success rate of endovascular embolization observed in this study corroborates findings from other studies, which have reported similar outcomes in terms of symptom relief and reduction in malformation size. The ability of DSA to guide these interventions in real time enhances its clinical value, making it the gold standard for both diagnosis and treatment planning in PVMs.

The findings of this study have important clinical implications. First, they underscore the necessity of utilizing DSA in the comprehensive evaluation of patients with suspected or confirmed PVMs. The detailed anatomical and hemodynamic information provided by DSA is crucial for accurate diagnosis, risk assessment, and therapeutic planning. Second, the study highlights the effectiveness of endovascular

embolization as a primary treatment modality for PVMs, offering a minimally invasive alternative to surgery with high success rates.

CONCLUSION

In conclusion, this study reaffirms the pivotal role of digital subtraction angiography in the diagnosis and management of peripheral vascular malformations. DSA provides unparalleled visualization of vascular anomalies, guides effective therapeutic interventions, and contributes to favorable clinical outcomes. Its continued use and integration with evolving interventional techniques hold promise for advancing the care of patients with PVMs.

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