

Frequency, Threat Factors, and Clinical Supplements of Ulnar Roadway Occlusion in the General Population

Abstract

Background

Occlusion of the ulnar artery is found in a substantial proportion of elderly patients. The aim of this study was to estimate the prevalence of ulnar artery occlusion in a sample of the general population of France, look for its risk factors, and evaluate its clinical correlates.

Methods

This study was an offshoot of a cross-sectional epidemiologic study in the general population of four locations in France (Tarentaise, Grenoble, Nylons, and Toulon). In phase I, random samples of 2000 individuals per location aged ≥ 18 years old were interviewed by phone for screening of Raynaud phenomenon. In phase II, subsamples of individuals were invited to a medical interview and physical examination where the presence of Raynaud phenomenon and occupational risk factors were recorded and a bilateral clinical Allen test was performed for the detection of ulnar artery occlusion. Phase II comprised 688 women and 335 men.

Results

In 36 men and seven women, at least one occluded ulnar artery was found. The estimated prevalence was 9.6% in men and 1.0% in women ($P < .001$). The occluded artery was more often in the dominant hand of both men (8.1% vs 2.4%; $P < .001$) and women (0.9% vs 0.4%; $P = .34$). Ulnar artery occlusion was found more often in men aged > 50 years (16.4%) than in younger men (1.4%; $P < .001$). Besides age, male sex, and dominant side, the only independent risk factor was an occupational exposure in men to repeated palmar trauma, with a significant quantitative relationship in the frequency of the impacts ($P < .001$) and the duration of the exposure ($P < .001$). Exposures to hand-held vibrating tools and cigarette smoking did not show a significant relationship in the multivariate analysis. Most individuals with ulnar artery occlusion did not have associated complaints; however, the diagnostic criteria for Raynaud phenomenon was validated in 13 of the 36 affected men. The association remained significant after adjusting for occupational exposure to vibrating tools. One individual reported a previous episode consistent with an attack of permanent digital ischemia.

Conclusion

This study confirms a substantial prevalence of ulnar artery occlusions in the general population, mostly in middle-aged and elderly men, which appears to be principally related to an occupational exposure to repeated occupational palmar trauma. Although there is a significant association with Raynaud phenomenon, most often the consequences of this occlusion remain subclinical.

Keywords: Polyarteritis nodosa • breast • Cancer • Raynaud phenomenon • Clinical supplements

Introduction

Polyarteritis Nodosa (PAN) belongs to a group of inflammatory disorders characterized by necrotizing vasculitis of small and medium sized blood vessels. Whether systemic or focal in appearance all manifestations share histopathological findings of arteritis. The

term PAN presently includes classic PAN, cutaneous PAN and microscopic PAN (microscopic polyangiitis [MPA]). Multi-organ involvement is more common than isolated organ involvement. PAN affecting the breast alone has been reported in very few patients [1]. To date, eleven patients with PAN

Patrick H Carpentier*

University Clinic of Vascular Medicine,
Multidisciplinary Center of Medicine,
University Hospital Center, Grenoble, France

*Author for Correspondence:

Cp@Patrick.com

Received: 01-June-2023, Manuscript No. FMIJCR-23-102901; **Editor assigned:** 03-June-2023, Pre-QC No. FMIJCR-23-102901 (PQ); **Reviewed:** 17-June-2023, QC No. FMIJCR-23-102901; **Revised:** 23-June-2023, Manuscript No. FMIJCR-23-102901 (R); **Published:** 30-June-2023, **DOI:** 10.37532/1758-4272.2023.18(6).123-125

involving the breast have been reported in the medical literature. In those it presented as an isolated vasculitis of the parenchymatous mammary tissue, as cutaneous PAN lesions of the breast skin envelope with involvement of breast fibro-glandular tissue, or finally as involvement of the glandular mammary tissue as part of the systemic classic PANS.

Eighty years ago, in 1929, Edgar Allen described his famous compression test for the evaluation of the distal arterial circulation of the upper limbs, and especially for the detection of the occlusion of the ulnar artery in patients suspected to have Berger disease. The Allen test is mainly used nowadays in the preoperative assessment of ulnar artery patency in patients undergoing coronary procedures endangering or harvesting the radial artery [2]. It is also a cornerstone of the clinical examination of patients with Raynaud phenomenon, in whom it is used for the etiologic diagnosis, because the evidence of an associated distal arterial disease of the upper limbs excludes a primary Raynaud diagnosis. Several studies using the Allen test in patients undergoing coronary interventions have shown a substantial prevalence of ulnar artery occlusion, most often evaluated on the non-dominant hand, with a median of about 12% (range, 5.6%-27%). These studies were focused on the practical consequences of the demonstrated arterial occlusion and did not look for its causes, with the exception of Hosokawa et al, 16 who retrospectively analyzed 2940 arms explored by the Allen test before radial catheterization, found 85 ulnar artery occlusions, and were able to find a potential explanation for only 12 patients. Thus to date, scarce information is available about the prevalence of ulnar artery occlusion, except in the coronary patient, and even more so for its etiology. We were unable to find any data from the general population about the whole issue [3].

Patients and Methods

Study participants

This work was done as an offshoot of an American-French epidemiologic study of Raynaud phenomenon conducted from 1988 to 1992. The sampling procedure is detailed in previous publications and can be briefly summarized as follows: Random samples from households of four geographic areas in the southeast of France—Traumatise (Savoie), Grenoble (Grésivaudan), Nyons (Baronnies), and Toulon (Côte d'Azur)—were obtained from telephone lists. Every individual aged ≥ 18 years and living in the selected households was included in the survey until the planned sample size of 2000 individuals per region was reached [4].

A 21-year-old Afro-Caribbean multi-paraous woman presented to the breast care unit in 2004 with a sudden onset necrotizing skin lesion involving the central, upper and lower lateral quadrants of left breast leading to inflammatory, hyperpigmented, tender skin changes. She concomitantly suffered from a gangrene of the dorsum and the distal small finger of the left hand. Medical history revealed sickle cell disease with recurrent deep venous thrombosis, retinopathy and pulmonary hypertension [5]. The clinical differential diagnosis at that time contained a non-lactational breast abscess, inflammatory carcinomatosis, necrotizing fasciitis and sickle cell crisis. Generalised sepsis urged a thorough surgical debridement of necrotic tissues with use empirical antibiotics. Surgical debridement revealed full thickness infarction of the skin and underlying breast parenchyma. Delayed second stage coverage of the defect was performed using a meshed split thickness graft (5 days). Light microscopy and culture of the removed breast tissue failed to detect an organism [6]. Histopathology revealed extensive vasculitis of small and medium sized vessels with fibrinoid necrosis of vessel walls in absence of malignancy. Blood cultures to exclude septic emboli proved to be negative. In view of these results the patient was referred to the rheumatology team for further evaluation with immunological and inflammatory workup which are shown in [7]. The patient was subsequently diagnosed with microscopic PAN (MPA) where anti-proteinase (PR3) Antineutrophilic Cytoplasmic Antibody (ANCA) was positive; she was started on corticosteroid therapy and azathioprine which achieved complete remission. Hospital stay was prolonged due to delayed wound healing. One year later she developed leg ulcers, which healed on steroid therapy. No further vasculitis episodes have been encountered since.

Discussion

Breast involvement is a rare site of apparently localized vasculitis; it can either be granulomatous or necrotizing in nature. Our cases demonstrate that it may be more common than expected when a high index of suspicion is used in the diagnostic approach. Diagnosis relies on histopathological examination of representative tissue specimen and the use of highly specific immunological tests in patients with suspicious features. These diagnostic modalities should be performed in all patients with an otherwise unexplained inflammatory change of the breast – even if systemic manifestations are lacking at that point [8]. The key importance of such an approach is the avoidance of unnecessary other treatment modalities and the timely recognition of PAN.

As seen here, breast manifestations can be amongst the first clinical manifestations and an accurate diagnosis is the key to initial and long-term management of this rare yet devastating disease. Multiple studies prove that such early diagnosis of PAN can reduce both mortality and morbidity due to the disease. It is clinically of prime importance to differentiate between isolated and systemic PAN which mainly depends on the exclusion of visceral involvement as isolated form has a much more favourable prognosis [9]. To our knowledge, this study is the first to evaluate the prevalence of ulnar artery occlusion in the general population in France and shows that it is highly prevalent (close to 10% in men), most often found in the dominant hand of elderly men, and associated with an occupational history of repetitive palmar trauma of long duration. The occlusion of the ulnar artery was clinically silent in most participants, but 36% experienced Raynaud phenomenon, and one (<3%) reported a history consistent with an episode of permanent digital ischemia. The reliability of these results depends on the value of the clinical Allen test, which is much debated in the cardiovascular literature for its use in the selection of patients eligible for coronary procedures using the radial artery. However, the sensitivity and specificity of the Allen test for the occlusion of the ulnar artery was quite high, at 95% and 100%, respectively, for Hirai compared with arteriography in 192 hands, and was 96% and 97%, respectively, for Pistorius et al in a series of 576 patients

with Raynaud phenomenon with a plethysmographic test as reference [10].

Conclusions

This study demonstrates the high prevalence of the occlusions of the ulnar artery in the elderly men of the general population and their epidemiologic significance of an acquired disease, mostly related to occupational exposure to repetitive palmar trauma. By far, these occlusions do not always lead to clinical consequences. The classic pattern of digital permanent ischemia or necrosis seems relatively rare (<3%); however, an association with Raynaud phenomenon was found in 36% of our participants. We propose that men with exposure to occupational palmar trauma for >10 years occlusion of the ulnar artery, and a predominance of Raynaud phenomenon on the side of the occlusion should be considered as having hypothenar hammer syndrome-associated Raynaud phenomenon. The possibility of a prevention of this traumatic arterial disease through information to exposed manual workers and implementation at work of procedures avoiding hand trauma should be encouraged.

Conflicts of Interest

None

Acknowledgment

None

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