



Classification of Raynaud's disease based on angiographic features

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Summary Accurate diagnosis and timely management are crucial to avoid an ischaemic consequence in Raynaud's disease. There is, however, no objective classification of this disorder which guides surgical planning in refractory cases. We propose a new classification system to achieve this. From 2003 to 2009, we treated 178 patients (351 hands) who underwent surgical intervention due to an ischaemic consequence. We analysed the angiographic features of the arterial supply of the hand at three levels: (1) radial or ulnar, (2) palmar arch and common digital and (3) digital vessels. Subsequent surgical interventions were tailored according to disease types, and these included combinations of: digital sympathectomy, balloon angioplasty and end-to-end interposition venous or arterial grafting. We classified Raynaud's disease into six types: type I and II involve the radial or ulnar arteries. Type I (27.3%) showed complete occlusion, while type II (26.2%) involved partial occlusion. Type IIIa (27.1%) showed tortuous, narrowed or stenosed common digital and digital vessels. Type IIIb (1.4%) is a subset which involved the digital vessel of the index finger related to exposure to prolonged vibration. Type IV and V showed global involvement from the main to digital vessels. Type IV (13.7%) showed diffused tortuosity, narrowing and stenosis. Type V (4.3%) is the most severe, with paucity of vessels and very scant flow. Nearly half (47%) of the patients had associated systemic disease. This new classification provides objective and valuable information for decision making regarding choice of surgical procedures for the treatment of patients with Raynaud's disease which had failed conservative therapy.

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Raynaud's disease is an important cause of hand ischaemia. It is associated with intermittent spasm of digital vessels, resulting in the characteristic colour changes in the digits, ischaemic pain and necrosis of finger tips.^{1,2}

Treatment ranges from conservative measures to sympathectomy and arterial or venous interpositional grafting. Prognosis is however generally poor, with low cure rates. Accurate diagnosis and timely intervention may avert the dreaded complication of digital necrosis, infection and amputation. This can be achieved if an accurate classification and categorisation exist, as this disorder has variable presentation and progression.

Raynaud's disease is conventionally classified into primary or secondary disorder.³ This is a gross categorisation based on aetiology but contributes little to the understanding of the status of the vessels involved and, hence, management decision. Angiography provides the most objective evaluation of radial, ulnar and digital vessel status. We have surgically managed 178 patients based on angiography findings and propose a new classification system for Raynaud's disease integral to the management algorithm.

Patients and Methods

We retrospectively analysed 178 patients (351 hands) treated between March 2003 to November 2009. Only five patients had unilateral disease. There were 45 (25%) male and 133 (75%) female patients, age ranging from 22 to 75 years (mean age of 45.4 years). All these patients revealed Raynaud's phenomenon and had failed medical therapy. They were referred to our institute which serves as a tertiary centre for the surgical management of Raynaud's disease. Persistent pain and digital ulceration were the prime motivations for their referral.

All patients underwent colour Doppler and infrared thermographic (IRT) study. This was followed by angiography, for which full blood counts and coagulation profile were performed before the procedure. Pethidine (Hcl 50 ml) was administered as premedication for angiography. We delivered the non-ionic iodinated contrast media iopromide (Ultravist 370 (Schering AG)) via a visceral Yashiro catheter (5Fr/Terumo). The images were processed by our X-ray angiography unit (using digital subtraction angiography (DSA) TRF- 1000 – 125, Axion Artis FA, Siemens, Germany). After angiography, the patients received compressive dressings over the femoral arterial puncture site and rested in bed for 4 h followed by chest X-ray to exclude pneumothorax.

All angiographic results were reviewed by the authors and a single radiologist who performed the procedure. We classified our angiographic findings according to features of the arterial supply of the hand at three levels: (1) radial and ulnar arteries, (2) palmar arch and common digital arteries and (3) digital arteries. Based on these angiographic features of the 351 hands treated, we classified Raynaud's disease into five types (type I–V) (Table 1). Type III disease is further sub-classified into type IIIa and IIIb.

Type I and II diseases manifest prominently in the level 1 vessels. In type I disease, there is complete occlusion of either the ulnar or radial artery, associated with decreased flow and narrowing in level 2 and 3 vessels

Table 1 Types of Raynaud's disease.

Type	Angiographic Feature		Frequency (%)	Chief Complaints	
	Radial or Ulnar artery	Palmar arch or common digital vessels		Persistent Pain (%)	Digital Ulceration (%)
Type I	Complete occlusion	Decreased flow	96 (27.3) Radial: 11 (11.5); ulnar: 85 (88.5)	82 (85.4)	12 (12.5)
Type II	Incomplete occlusion	Decreased flow	92 (26.2) Radial: 4 (4.3); ulnar: 88 (95.7)	71 (77.2)	10 (10.9)
Type IIIa	Relatively normal	Slightly tortuous common digital vessels.	95 (27.1)	64 (67.4)	19 (20.0)
Type IIIb	Relatively normal	Slightly tortuous, narrowed or stenotic common digital vessels.	5 (1.4)	5 (100)	1 (20.0)
Type IV	Tortuous	Tortuous, narrowed or stenotic common digital vessels.	48 (13.7)	35 (72.9)	6 (12.5)
Type V	Severely narrowed.	Severely narrowed or stenotic common digital vessels. Very poor flow	15 (4.3)	12 (80.0)	4 (26.7)

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