Uncontrolled Bp as trigger for central and peripheral arterial diseases

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introduction

Aortic and peripheral arterial diseases may coexist in patients with hypertension.

Although aortopathies and peripheral arterial disease can be seen in patients with multiple cardiovascular risk factors, hypertension being chief among them.

PATHOLOGIC MECHANISMS OF HYPERTENSION AND ATHEROSCLEROSIS

Renin-Angiotensin System and Atherosclerosis

blood pressure alterations from the manipulation of the renin angiotensin system has a direct impact on the size of atherosclerotic lesions.

Angiotensin II is a potent vasoconstrictor, specifically on the efferent arteriole, and mediator of aldosterone secretion.

The studies have shown that pharmacologic inhibition of the renin-angiotensin system decreases the development of atherosclerosis independent of blood pressure lowering.

Endothelial Dysfunction and Hypertension

Hypertension is associated with endothelial dysfunction in the coronary, renal, and peripheral circulation.

Endothelial dysfunction occurs early in the atherosclerotic process.

A reduction on nitric oxide may lead to reduced vasodilation, increased inflammation, and increased coagulation.

Maintenance of normal endothelial function and appropriate vasodilation is important to both blood pressure control as well as the development of atherosclerosis.

Aortic Disease in Hypertension

Aortic disease can present suddenly and catastrophically, or may be found incidentally on unrelated imaging studies.

Although many infectious, inflammatory, and genetic conditions can contribute to disease processes found in the aorta, appropriate blood pressure control represents a pillar in the prevention of disease progression.

Thoracic Aortic Disease

Hypertension plays a significant role in the development of TAD in combination with multiple other risk factors including age, atherosclerosis, smoking, and underlying genetic and congenital factors.

The major histopathological disease processes that affect the thoracic aorta include atherosclerosis, inflammatory disease, and vasculitides, as well as dissection and aneurysm formation.

Acute Aortic Syndromes (i.e., Aortic Dissection)

Disease processes classified as acute aortic syndromes (AAS) include:

- aortic dissection (AoD); (most commonly)
- intramural hematoma (IMH).
- penetrating atherosclerotic ulcer (PAU).

They represent interconnected emergent aortic conditions with similar clinical features and oftentimes are challenging to treat effectively.

Aortic Dissection

The incidence of AoD is difficult to define given that dissections may be rapidly fatal and are frequently missed on initial presentation.

A recent prospective population-based study reveals the incidence of AoD to be 6 cases per 100,000 person years.

Risk of aortic dissection increases with age and male sex is a risk factor.
In 75% of AoD cases, the individual has hypertension.

Classification of aortic dissections

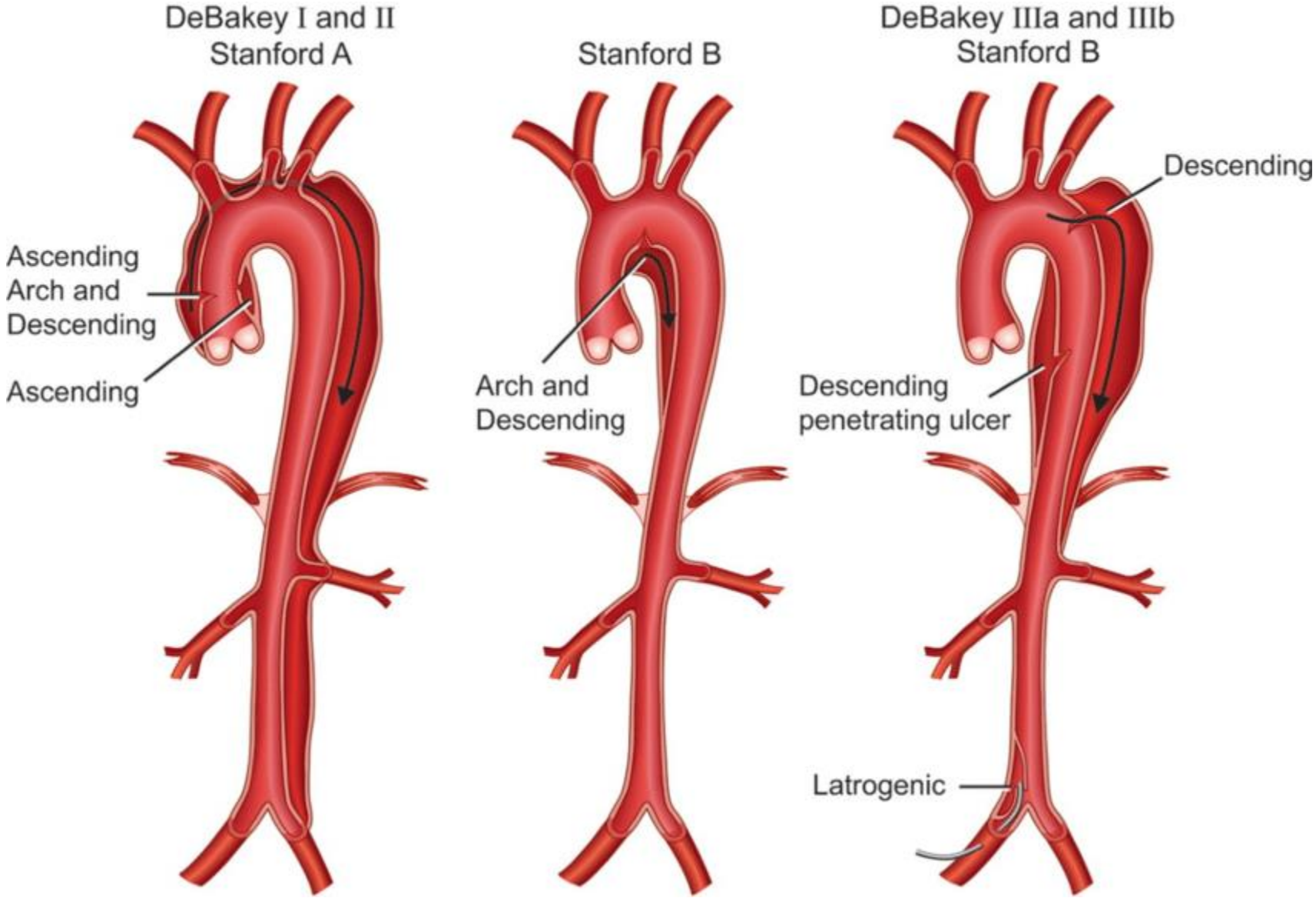
is based on two major systems, **Stanford and DeBakey** classification schema. The Stanford system is more widely used in clinical practice.

- **Stanford type A dissections** involve the ascending aorta with or without the aortic arch or descending aorta.

- **Type B dissections** involve the descending aorta without any involvement of the ascending aorta.

Dissections involving the ascending aorta and aortic arch vessels are at highest risk for complications including stroke.

These Type A dissections are best treated with emergent surgical management.


DeBakey I and II
Stanford A
Ascending
Arch and
Descending
Ascending
Stanford B
Arch and
Descending
DeBakey IIIa and IIIb
Stanford B
Descending
Descending
penetrating ulcer
Latrogenic

A key factor in management of type B dissections is determining the presence of complications. Including uncontrolled hypertension.

Short-term survival (3-year) appears to be unaffected by endovascular treatment in acute uncomplicated type B dissections compared with medical management as demonstrated by **the INSTEAD trial**.

However, **the INSTEAD XL-trial** demonstrated that endovascular treatment in addition to optimal medical therapy is associated with improved 5year aorta-specific survival and delayed disease progression.

On the other hand, complicated type B dissections may benefit from endovascular intervention as described in Study for the Treatment of complicated type B Aortic Dissection using Endoluminal repair (**STABLE**) trial.

Half of all patients with aortic dissections present with elevated systolic blood pressures (SBPs) (>150 mm Hg) and alternatively, 20% of patients present with hypotension and/or shock.

Pulse pressure (PP), at the time of presentation, may also be a prognostic value in those with type A dissections.

recently determined that patients with type A AoD with narrow PP (<40 mm Hg) were more likely to have cardiac complications such as cardiac tamponade, whereas those with PP greater than 75 mm Hg were more likely to have abdominal aortic involvement.

Upon diagnosis of thoracic AoD, initial management should focus on decreasing aortic wall stress, by controlling heart rate and BP.

So the target of heart rate is less than 60 and the systolic Bp less than 110.

uncomplicated type B dissections with appropriately controlled pain and hypertension have lower in-hospital mortality than those patients with uncontrolled hypertension and/or pain.

Long-Term Blood Pressure Management Following Repair of Type A Dissections

a recent retrospective review of patient characteristics impacting long-term outcomes following type A dissection repair, highlights the importance of blood pressure control and choice of antihypertensive medication, even after operative repair.

at 10-year follow-up, of those patients that maintained an SBP less than **120** mm Hg, only 8% required reoperation, compared with 26% in patients with SBP between **120 and 140** mm Hg, and 51% in those with SBP greater than **140** mm Hg.

Similarly, patients taking beta-blockers at 10 years post repair had an 86% freedom from reoperation, compared with 57% for those not taking beta-blockers.

Long-Term Blood Pressure Management Type B Dissections

Irrespective of interventional management, control of BP remains a hallmark of immediate and long-term management of type B AoDs.

Current guidelines recommend BP control similar to that of the general population .

Beta-blockers are currently recommended in all patients with type B AoD, if not contraindicated., based on data in Marfan syndrome patients that beta-blockade attenuates aneurysmal expansion, in addition to ARBS.

Thoracic Aortic Aneurysms

The incidence of TAA is increasing (it is currently 10.4 cases per 100,000 persons per year) and influenced by risk factors similar to those for atherosclerosis.

The majority of aneurysms of the TAA affect the ascending aorta (60%), followed by descending(20%), with only approximately (10%) involving the aortic arch.

Rates of expansion vary based on aneurysm location, pathogenesis, and size. In addition, control of risk factors for further aneurysm growth is recommended, including aggressive BP and cholesterol management, as well as smoking cessation.

Abdominal Aortic Aneurysms

Abdominal aortic aneurysms (AAA) are the most common form of arterial aneurysm.

elevations in diastolic blood pressure were tied to increased expansion rates.

only a small proportion of patients, when initially diagnosed with an AAA, meet criteria for aneurysm repair{ the size >5.5}.

Thus, before operative repair is indicated, observation and medical management are therapy mainstays.

Of course, appropriate blood pressure control reduces an individual's overall cardiovascular risk and this benefit is seen in patients with abdominal aortic disease.

Multiple studies have investigated whether antihypertensive medications decrease aneurysm expansion rates, but none demonstrates a clear impact on AAA size.

Peripheral arterial disease (PAD)

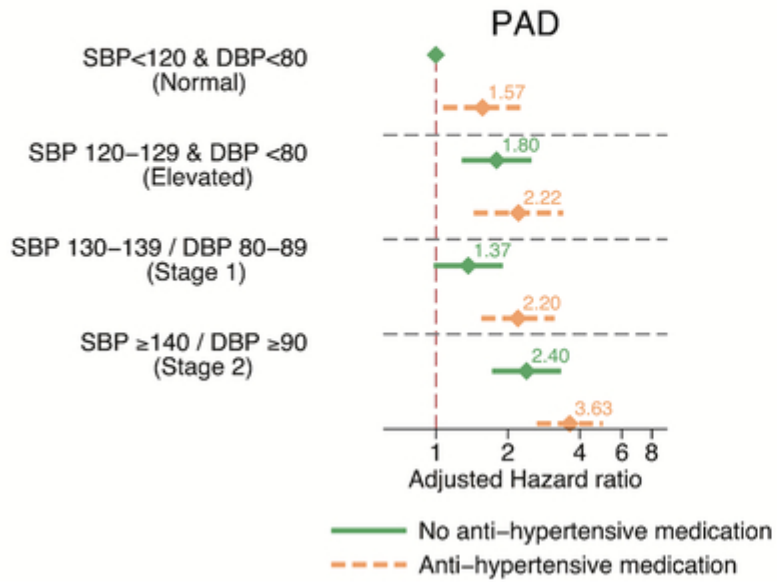
Peripheral arterial disease (PAD) of the lower limbs is associated with a high cardiovascular morbidity and mortality.

Intermittent claudication is the most common symptomatic manifestation of PAD, but is in its own value an important predictor of cardiovascular death, increasing it by three-fold, and increasing all-cause mortality by two-to-five fold.

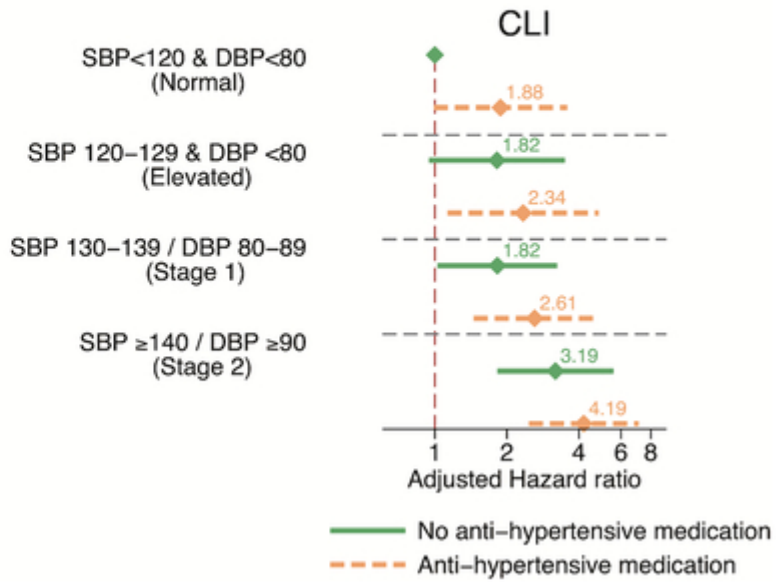
Hypertension is a risk factor for vascular disorders, including PAD. Of hypertensives at presentation, about 2-5% have intermittent claudication, with increasing prevalence with age. Otherwise, 35-55% of patients with PAD at presentation also show hypertension.

Systolic blood pressure, including the category of 130-139 mmHg, showed stronger associations with incident PAD than did diastolic blood pressure.,

A.


PAD
SBP<120 & DBP<80
(Normal)
1.57
SBP 120–129 & DBP <80
(Elevated)
1.80
2.22
SBP 130–139 / DBP 80–89
(Stage 1)
1.37
2.20
SBP ≥140 / DBP ≥90
(Stage 2)
2.40
3.63
1
2
4
6
8
Adjusted Hazard ratio
No anti–hypertensive medication
Anti–hypertensive medication

B.


CLI
SBP<120 & DBP<80
(Normal)
1.88
SBP 120–129 & DBP <80
(Elevated)
1.82
2.34
SBP 130–139 / DBP 80–89
(Stage 1)
1.82
2.61
SBP ≥140 / DBP ≥90
(Stage 2)
3.19
4.19
1
2
4
6
8
Adjusted Hazard ratio
No anti–hypertensive medication
Anti–hypertensive medication

Patients who suffer from hypertension with PAD have a greatly increased risk of myocardial infarction and stroke.

Evidence on the use of various anti-hypertensive drugs in people with PAD is poor so that it is unknown whether significant benefits or risks accrue.

the most important goal remains to decrease the global cardiovascular risk in such patients rather than to focus on the control of blood pressure only and on the reduction of symptoms of PAD.

Upper extremity ischemia

is less common than lower extremity ischemia.
Possible etiologies could be vasospastic or occlusive.

Vasospastic etiologies are more responsive to pharmacologic intervention, with nifedipine and losartan the best studied medications.

Sympathectomy does not confer a durable response in vasospasm and is of little to no use in occlusive disease.

Finally, bypass is a viable option in patients with occlusive disease with excellent 1- to 3-year outcomes

THANK YOU