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"A REVIEW ARTICLE ON HYPERTENSION"

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ABSTRACT

The most common modifiable risk factor for death and disability is hypertension, which includes stroke, accelerated coronary and systemic atherosclerosis, heart failure, chronic kidney disease, lowering blood pressure with antihypertensive drugs, and reducing target organ damage and the prevalence of the occurrence of cardiovascular disease.

Reducing dietary sodium intake, losing weight if the patient is overweight, getting regular exercise, drinking moderately, and eating more potassium-rich foods were all recommended lifestyle changes.

The first antihypertensive medication should be chosen from one of the four types known to minimise cardiovascular events: thiazide diuretics, ACE inhibitors, ARBs, and calcium channel blockers. In clinical practise, two interventional approaches—renal denervation and baroreflex activation therapy—are employed to treat a variety of treatment-resistant hypertensions.

KEYWORD: Target Blood Pressure; Antihypertensive Drugs Therapy; Renal Denervation; Systemic arterial hypertension ; Renin-angiotensin-aldosterone system

INTRODUCTION

Hypertension, defined as an increase in systolic blood pressure, diastolic blood pressure, or both above normal ranges, is widespread in both industrialised and developing countries, and its prevalence rises with age.

Systemic arterial hypertension (also known as hypertension) is defined by persistently high blood pressure (BP) in the systemic arteries. The ratio of systolic BP (the pressure that the blood exerts on the artery walls when the heart contracts) to diastolic BP (the pressure when the heart relaxes) is widely used to express blood pressure.

High blood pressure is also known as hypertension. It can cause serious health problems and increase the risk of heart disease, stroke, and even death. The force exerted by a person's blood on the walls of their blood

vessels is referred to as blood pressure. This pressure is determined by the resistance of the blood arteries and the amount of work required by the heart.

Dietary factors and physical inactivity contribute to the genetic predisposition, while environmental factors include smoking, drinking, obesity and alcohol, thus making hypertension a preventable cause of morbidity and mortality. The advantages of populations with hypertension leading a healthy lifestyle cannot be stressed enough, and this includes a controlled diet and regular exercise. The primary goal of treatment is to abolish the risks factors associated with hypertension, without reducing the patient's quality of life[4-7]

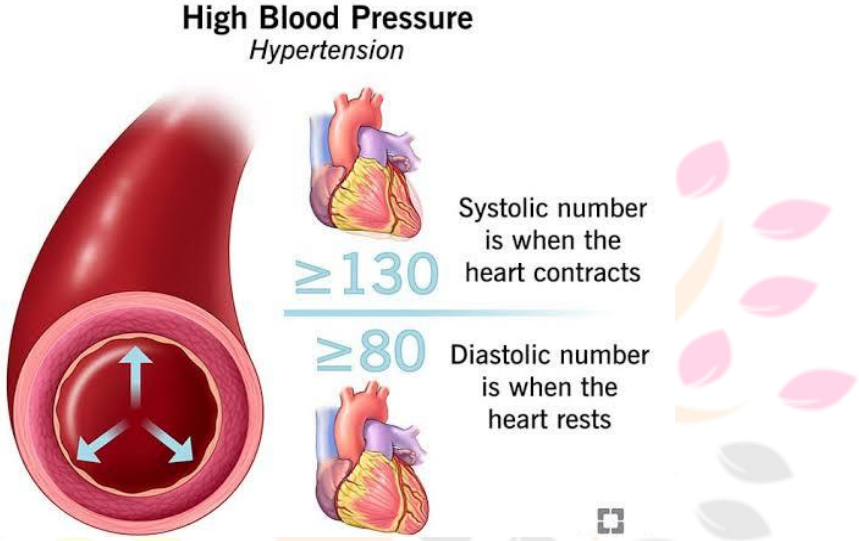

Fig.1 Hypertension

Although in recent years hypertension was defined as a blood pressure of 140/90 mmHg or higher, the 2017 American College of Cardiology-American Heart Association (ACC-AHA) Hypertension Guideline adopted a lower threshold, defining hypertension as a systolic blood pressure of 130 mmHg or higher or a diastolic blood pressure of 80 mmHg or higher [1].

The overall prevalence of hypertension in adults in the United States was 31.9% under the old criteria (blood pressure, 140/90 mmHg) and 45.6% under the 2017 ACC/AHA guideline definition (BP 130/80 mmHg) [2]. Similarly, among those getting treatment with a target of less than 140/90 mmHg, the rate of hypertension control was 61.0%, but only 46.6% with a target of less than 130/80 mmHg [2].

Treatment with antihypertensive medications that lower both BP and associated target organ damage can significantly lower the increased risk brought on by BP rise.

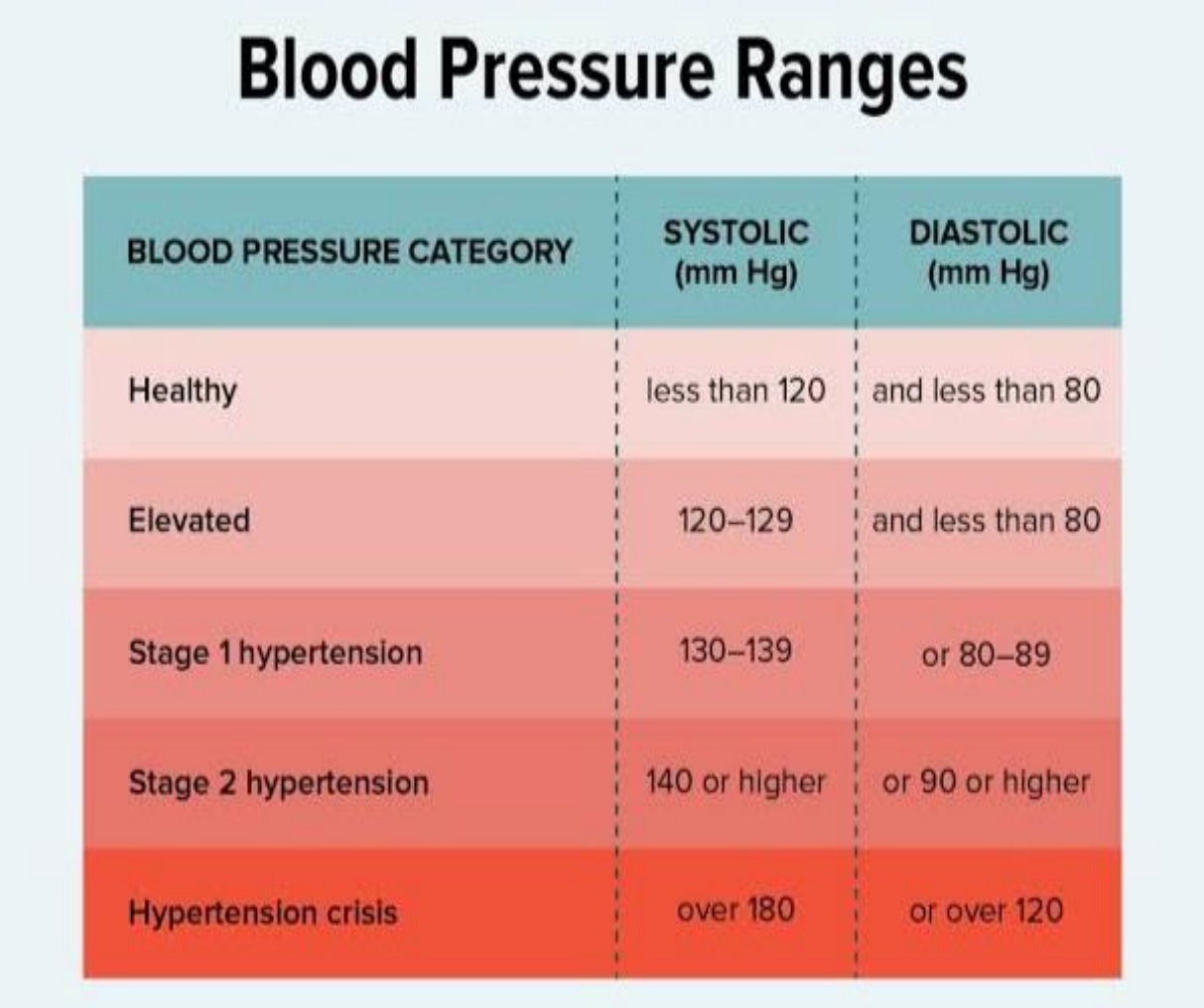

Fig.2 Blood Pressure Ranges

ANTIHYPERTENSIVE AGENTS

A class of medications known as antihypertensives is used to treat hypertension (high blood pressure).[1] Antihypertensive therapy aims to stop the effects of high blood pressure, such as myocardial infarction, stroke, heart failure, and kidney failure. According to the evidence, lowering blood pressure by 5 mmHg can decrease the risk of stroke by 34%, ischemic heart disease by 21%, dementia, heart failure, and cardiovascular disease mortality.[2] Antihypertensives come in a variety of classes and work to reduce blood pressure in various ways.

Thiazide diuretics, calcium channel blockers, ACE inhibitors, angiotensin II receptor antagonists (ARBs), and beta blockers are some of the most significant and popular medicines.

S/N	Anti-hypertensive drugs	Medications
1	Alpha adrenoceptor antagonists	Doxazosin, Prazosin, Terazosin
2	Beta-adrenoceptor antagonists or β-blockers/ beta-adrenergic blocking agents (BABAs)	Acebutolol, Atenolol, Bisoprolol, Metoprolol, Nadolol, Nebivolol, Propranolol
3	Calcium channel blockers (CCBs)	Amlodipine, Diltiazem, Felodipine, Isradipine, Nicardipine, Nifedipine, Nisoldipine, Verapamil
4	Angiotensin II receptor blockers (ARBs)	Azilsartan, Candesartan, Eprosartan, Irbesartan, Losartan, Olmesartan, Telmisartan, Valsartan
5	Antiarrhythmics	Amiodarone, Flecainide, Propafenone
6	Angiotensin converting enzyme inhibitors (ACE-I)	Benazepril, Captopril, Enalapril, Fosinopril, Lisinopril, Moexipril, Perindopril, Quinapril, Ramipril, Trandolapril
7	Diuretics	Thiazide diuretics- Chlorothiazide, Chlorthalidone, Hydrochlorothiazide, Indapamide, Metolazone. Potassium-sparing diuretics – Amiloride, Eplerenone, Spironolactone, Triamterene Loop diuretics – Bumetanide, Ethacrynic acid, Furosemide, Torsemide

Fig.3 Classification of Antihypertensive agents

SPHYGMOMANOMETER: A mercury sphygmomanometer is the common device used to monitor blood pressure. Mercury, which has long filled the middle column of traditional sphygmomanometers, is measured in units of mercury.

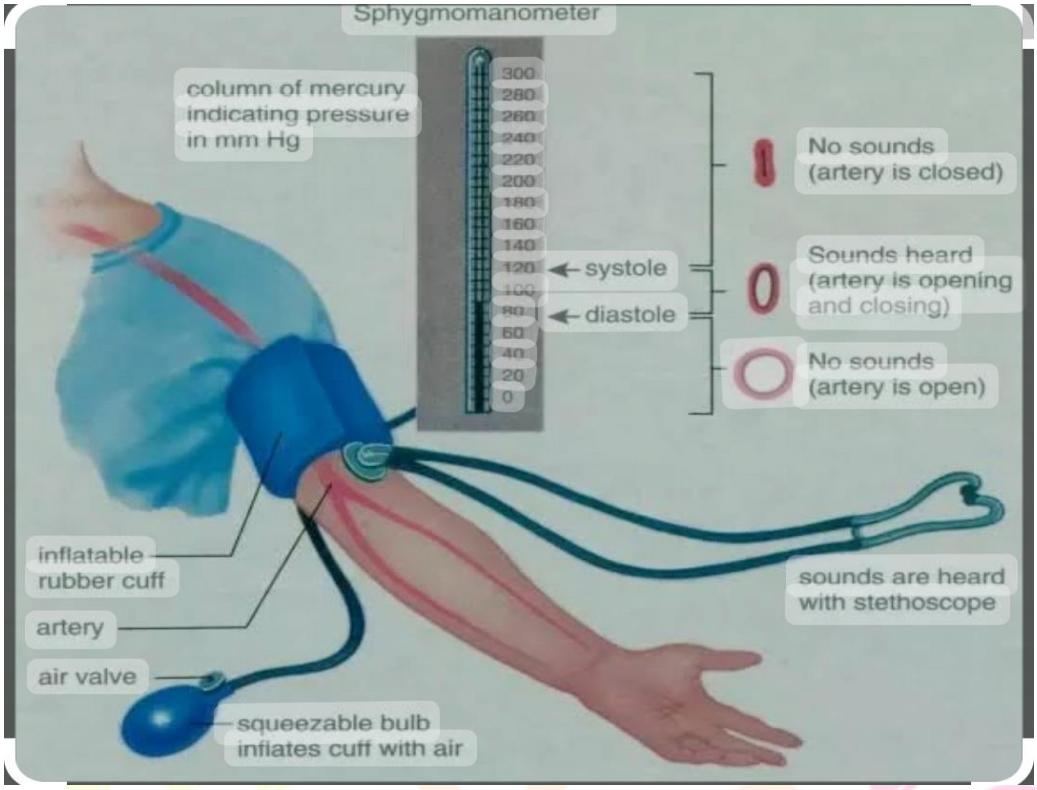

Fig.4 Sphygmomanometer

MECHANISM OF BP REGULATION

Blood volume, cardiac output, or how much blood the heart pumps out each minute, as well as the balance of arterial tone, which is influenced by both intravascular volume and neurohumoral systems, are all factors in determining blood pressure.

The renin-angiotensin-aldosterone system (RAAS), the role of natriuretic peptides and the endothelium, the sympathetic nervous system (SNS), and the immune system all play a part in the complex interplay necessary to maintain physiological blood pressure levels.

Increases in means may result directly or indirectly from BP control factor dysfunction or disruption in any of these systems.

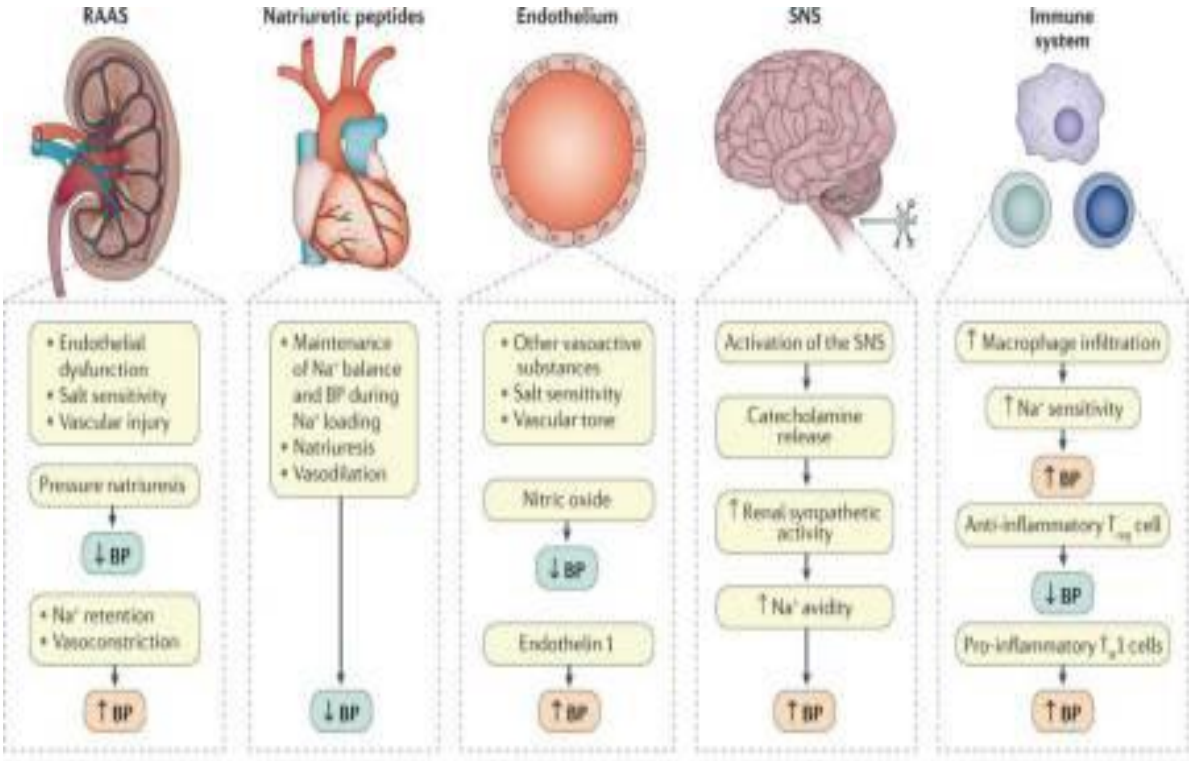

Fig.5 Mechanism of BP Regulation

DIAGNOSIS, SCREENING AND PREVENTION

Since essential or primary hypertension frequently has no symptoms, all individuals should have their blood pressure checked at routine doctor appointments.

Repeated blood pressure readings taken in a medical office setting are the most prevalent method of diagnosing hypertension.

To classify the level of BP, determine the risk of BP-related CVD, and provide management guidance, accurate BP measurement and recording are crucial. Since 2010, techniques to gauge out-of-office blood pressure have been adopted more frequently to aid in the diagnosis and management of hypertension.

These include ambulatory blood pressure monitoring (ABPM) and home blood pressure monitoring (HBPM).

DIAGNOSIS

The diagnosis of increased BP alone is insufficient for the examination of a patient with hypertension. Along with identifying symptoms suggestive of secondary hypertension, it should also assess the risk of CVD, target organ damage, and concurrent clinical illnesses that may affect BP or related target organ damage. Some of these investigations consist of mandatory examinations and standard procedures. A single gene mutation accounts for the pathophysiology of hypertension in rare inherited variants of the condition.

A accurate diagnosis may result in a cure or a significant improvement in blood pressure control with a decrease in the risk of cardiovascular disease (CVD) in a small percentage of individuals who have a potentially treatable cause of hypertension.

Therefore, it is appropriate to implement a straightforward secondary hypertension screening for all patients. Clinical history, a physical exam and standard laboratory tests form the basis of the screening.

Administration and treatment: The most common and effective treatment for hypertension is a change in lifestyle.

REGULAR PHYSICAL EXCERCISE

According to current recommendations, everyone, including those who have hypertension, should exercise for 75 minutes a week at a high level or 150 minutes at a moderate intensity.

STRESS REDUCTION

Blood pressure can be managed by avoiding or learning to manage stress. Relaxation methods that can aid with stress relief include yoga, meditation, warm baths, and long walks.

To relieve stress, people shouldn't turn to substances like alcohol, marijuana, nicotine, or junk food, as these might raise blood pressure and cause issues from hypertension.

Smoking may cause blood pressure to rise. The risk of hypertension, major cardiac diseases, and other health problems is decreased by avoiding or quitting smoking.

MEDICATION

Specific drugs can be used by individuals to treat hypertension. Doctors frequently advise starting with a low dose. Typically, antihypertensive medicines only cause modest adverse effects. In order to control their blood pressure, patients with hypertension will eventually need to mix two or more medications.

Medications for hypertension include:

- Diuretics, including thiazides, chlorthalidone and indapamide.
- Beta-blockers and alpha-blockers
- Calcium-channel blockers
- Central agonists
- Peripheral adrenergic inhibitor
- Vasodilators
- Angiotensin-converting enzyme (ACE) inhibitors
- Angiotensin receptor blockers

Angiotensin-converting enzyme inhibitors and angiotensin II receptor blockers

Other antihypertensive medications targeting RAAS, such as direct renin inhibitors and mineralocorticoid receptor antagonists, are typically considered reserve medications because there is less clinical trial evidence supporting their use as first line antihypertensive therapy. Among medications that inhibit components of the

RAAS, ACE inhibitors and angiotensin II receptor blockers are considered first line antihypertensives. In substantial trials for hypertension, ACE inhibitors and angiotensin II receptor blockers have been evaluated.

Both medication classes improved outcomes in patients with heart failure with decreased left ventricular ejection fraction or with diabetic nephropathy, making them particularly advantageous in these populations. Both groups seem to be equally effective at lowering the risk of CVD.

Dihydropyridine calcium channel blockers

Dihydropyridine calcium channel blockers cause vasodilation by obstructing L-type calcium channels in vascular smooth muscle. They are potent antihypertensive medications with a wealth of knowledge from many clinical studies. This pharmacological class's ability to be taken with all other first-line antihypertensives is a practical benefit. A typical adverse effect, especially in obese people, is peripheral edoema, which is explained by peripheral arterial vasodilation rather than worsening heart failure or renal disease.

Nondihydropyridine calcium channel blockers, especially verapamil, also lower cardiac calcium channels, which can reduce heart rate and cardiac contractility[1]

Thiazide-type and thiazide-like diuretic

Thiazide-type diuretic such as hydrochlorothiazide, lack the benzothiadiazine ring but thiazide-like diuretics, such as chlorthalidone, metolazone, and indapamide, do. Since the earliest trials demonstrating the morbidity advantages of antihypertensive medication, both subclasses of thiazide diuretics block Na+ and CIcotransporters in renal tubules, hence inducing natriuresis, and have been a crucial part of pharmacological hypertension control.

To achieve improved risk-benefit profiles, diuretic doses have been significantly decreased over time. However, whether or not this metabolic activity translates into long-term increases in CVD risk has been questioned. Thiazide-type and thiazide-like diuretics can affect glucose metabolism raising the risk for new onset diabetes mellitus.

Beta-adrenoreceptor blockers

By reducing cardiac output, heart rate, renin release, and effects on the adrenergic control of the nervous system, beta-adrenoreceptor blockers lower blood pressure. Beta-adrenoreceptor blockers perform better than other first-line antihypertensives in reducing CVD morbidity and mortality after acute myocardial infarction and in patients with heart failure who have reduced left ventricular ejection fraction, but not when these comorbidities are present. This impact has been linked to decreased aortic BP decreases and negative effects of beta-adrenoreceptor blockage on body weight and glucose metabolism.

With more recent beta-adrenoreceptor blockers, such as sinus node rate or atrioventricular conduction, some of these drawbacks may be decreased.

REDUCING SALT

Intake of the average daily salt intake for people in the majority of nations is between 9 and 12 grammes(g). To reduce the risk of hypertension and related health issues, the World Health Organisation (WHO) advises lowering intake to under 5g a day.

Instead, experts recommend:

- Whole grain, high fiber foods
- A variety of fruit and vegetables
- Beans, pulses, and nuts
- Fish rich in omega-3 twice a week
- Nontropical vegetable oils, for example, olive
- Oil skinless poultry and fish
- Low fat dairy products

MANAGING BODY WEIGHT

Extra body weight might make hypertension worse. Losing weight typically causes blood pressure to drop since the heart doesn't have to work as hard to pump blood throughout the body.

THE DASH DIET

DASH stands for "Dietary Approaches to Stop Hypertension."

NHLBI recommend the DASH dietTrusted Source for people with high blood pressure.

- Lowers high blood pressure
- Improves levels of fats in the bloodstream
- Reduces the risk of cardiovascular disease

CAUSE

Primary hypertension can result from multiple factors, including:

- Blood plasma volume
- Hormone activity in people who manage blood volume and pressure using medication
- Environmental factors, such as stress and lack of exercise
- Diabetes, due to kidney problems and nerve damage
- Kidney disease
- Pheochromocytoma, a rare cancer of an adrenal gland
- Cushing syndrome that corticosteroid drugs an cause
- Congenital adrenal hyperplasia, a disorder of the cortisol-secreting adrenal glands
- Hyperthyroidism, or an overactive thyroid gland
- Hyperparathyroidism, which affects calcium and phosphorous levels

- Pregnancy
- Sleep apnea
- Obesity

A family history of hypertension and poorly managed stress can both increase the chance of developing hypertension.

COMPLICATIONS

Long-term hypertension can result in issues from atherosclerosis, which narrows blood arteries when plaque builds up on their walls. Due to the increased effort required for the heart to pump blood, this constriction contributes to hypertension.

Hypertension-related atherosclerosis can lead to:

- Heart failure and heart attacks
- Aneurysm, or abnormal bulge in the wall of an artery that can burst
- Kidney failure
- Stroke
- Amputation
- Hypertensive retinopathies in the eye which can lead to blindness.

The 130 mmHg systolic value denotes the pressure experienced as the heart circulates blood throughout the body. The 80 mmHg diastolic value represents the pressure experienced as the heart relaxes and fills with blood.

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