

CHAPTER 1

INTRODUCTION

The design of wearable physiological measurement systems has been a growing research interest due to the potential applications in medicine, sports and security. As the number of elderly people in the world are increasing and due to emerging chronic diseases because of the changes in the lifestyle of people, there has been a need to monitor the health status of individuals in their daily routine at home to prevent fatal disorders[5]. Therefore, adoption of mobile health care technology is promising approach to enhance the quality of life[7] in the world. There are a number of health issues whose treatment benefits from continuous vital sign monitoring. Portably and wirelessly enabling these devices provides greater mobility and improves the efficiency.

1.1 PULSE

The pulse represents the palpation of the blood vessel by the trained Ayurvedic practitioner. The pulse of the subject can be palpated at any place where a vessel, particularly artery to be compressed against the bone. The palpation sites are at the neck (carotid artery), brachial artery that is inside the elbow. Femoral artery that is groin, Radial artery is present at the wrist and popliteal artery near the ankle joint. The pulse signals will give rise to various rhythms which will help in diagnosis of certain fatal conditions of the human body.

1.1.1 Physiology

The pulse is a high yield and old technique still useful in the computational analysis of cardiac diseases in humans. A trained observer Claudius Galen is the first physiologist to describe the pulse. He determined systolic blood pressure by observing the pulse signals on the wrist. Diastolic blood pressure is non-palpable and unobservable by tactile methods which will occur between heartbeats.

The arterial walls move by the pressure generated from systole of the heart-beat. The blood moves forward when the boundaries are pliable and compliant. A palpable pressure wave is created from these properties.

The pulse rate may be more or less than the heart rate. The pulse velocity deficits and much more physiologic data are readily and simplistically visualized by the use of one or more arterial catheters connected to an oscilloscope through transducer. This invasive technique is

commonly used in intensive care from 1970s.

The pulse rate is observed by visual or tactile means on the outside of an artery and is measured and recorded as Beats per Minute (BPM).

Indirectly pulse may be observed under light absorbance of varying wavelengths with inexpensively reproduced Beats per Minute (BPM) with mathematical ratios. The variance of light signal due to blood component haemoglobin for oxygenated versus deoxygenated blood is the technology used in oximetry.

Capture of variances of light signal from the blood component haemoglobin under oxygenated blood versus deoxygenated blood conditions allows the technology of pulse oximetry.

1.1.2 Common palpable sites

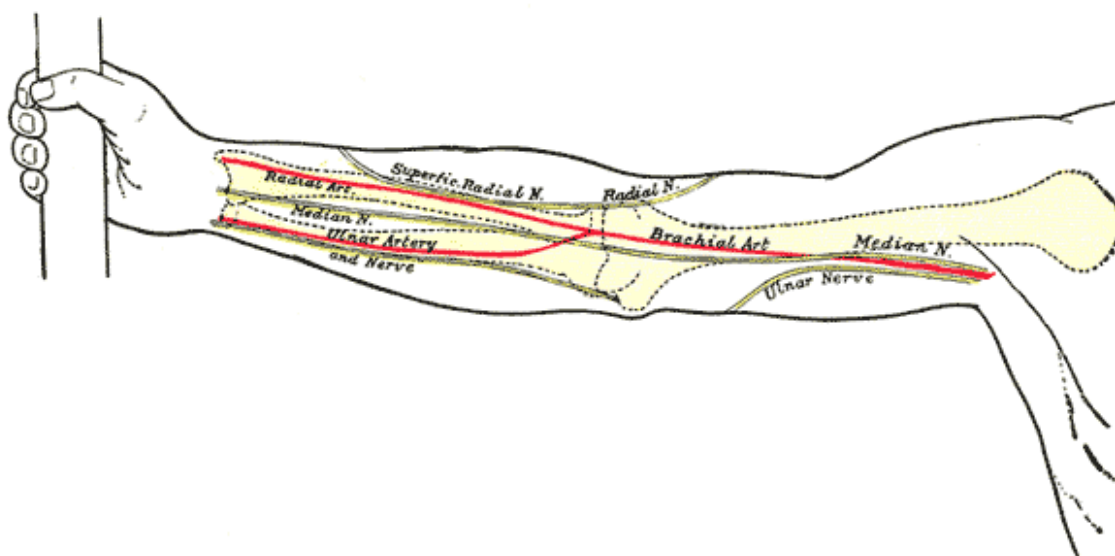


Figure 1.1.2a. Front of Right Upper Extremity

Upper limb

- Axillary pulse is observed inferior to the lateral wall of the axilla.
- Brachial pulse can be located on the inside of the upper arm near the elbow, frequently used in place of carotid pulse in infants (brachial artery).
- Radial pulse is located on the lateral of the wrist. It can also be found in the anatomical snuff box.
- Ulnar pulse can be observed on the medial of the wrist (ulnar artery).

From several centuries Chinese medicine has focused on the pulse in the upper limbs. The

concept of pulse diagnosis is essentially a treatise based upon palpation and observations of the radial and ulnar volar pulses at the readily accessible wrist.

Lower limb

Femoral pulse can be observed in the inner thigh, at the mid-inguinal point, halfway between the pubic symphysis and anterior superior iliac spine (femoral artery).

Popliteal pulse: this is observed above the popliteal fossa, found by holding the bent knee.

Foot

The Dorsalis pedis pulse in dorsalis pedis artery, which is located on top of the foot, it can be sensed immediately lateral to the extensor of hallucis longus

Tibialis posterior pulse is located on the medial side of the ankle. This can be observed by holding the fingers 2 cm inferior and 2 cm posterior to the medial malleolus (posterior tibial artery).

Head and neck

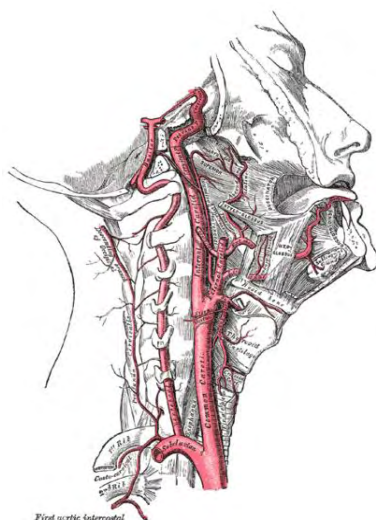


Figure 1.1.2b. Arteries in the Neck

The carotid artery is palpated to detect the Carotid pulse in the neck. The palpation of the carotid artery should be done carefully, while the subject is sitting or lying. If the baroreceptors are stimulated it will provoke severe bradycardia which may also lead to death. The important

thing to be kept in mind is the two carotid arteries should not be palpated at once. It may reduce the blood flow to the head and leads to fainting or brain ischemia. This carotid pulse can be felt between the anterior border of the sternocleidomastoid muscle, above the hyoid bone and lateral to the thyroid cartilage.

Torso Apical pulse is located in the in between fourth and fifth or fifth left intercostal space just outside the mid-clavicular line. Temporal pulse is observed on the temple directly in front of the ear (superficial temporal artery). We can locate the facial artery on the mandible below the lower jaw of the mouth.