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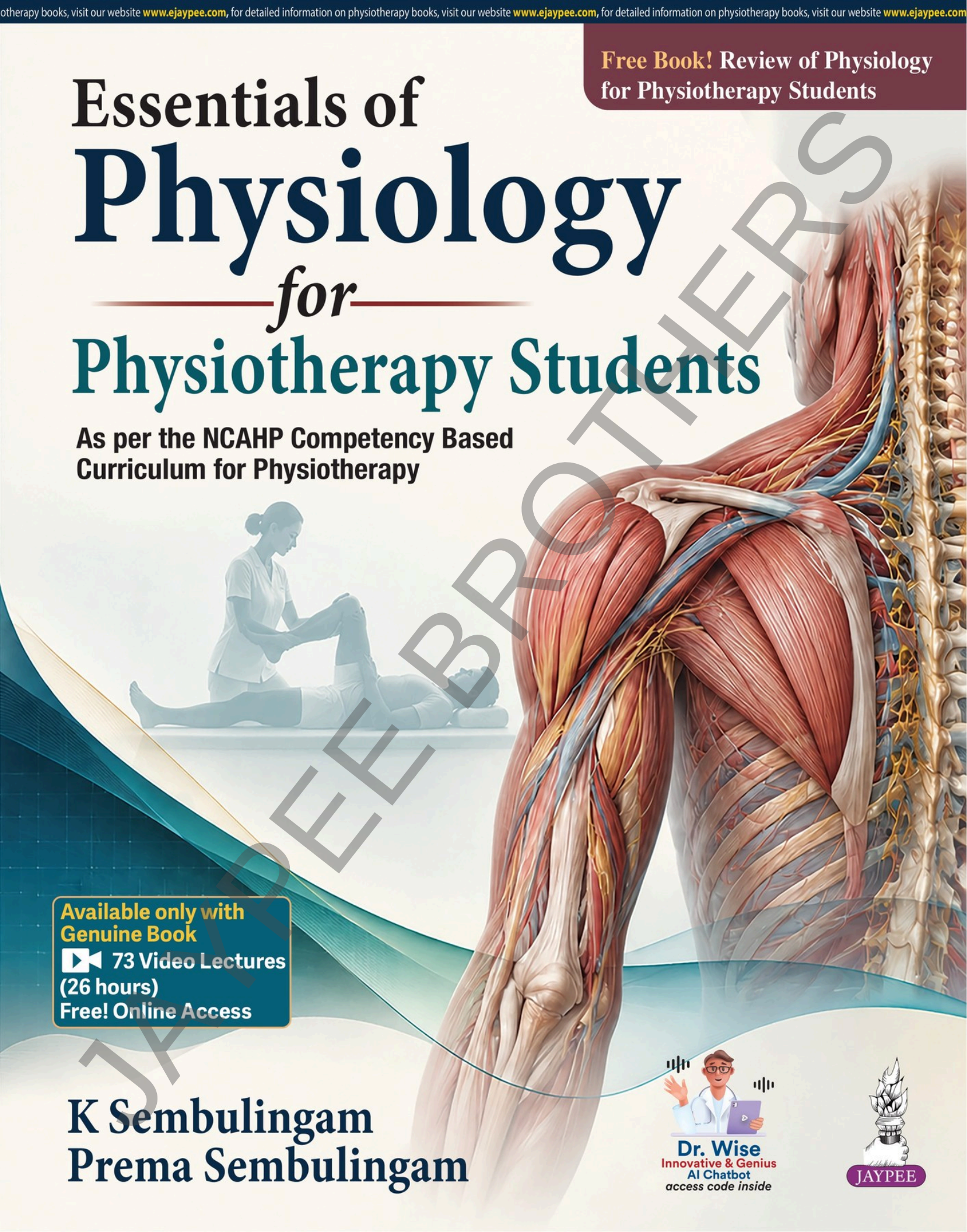

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Chapter 17

Hemostasis

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CHAPTER OUTLINE

- DEFINITION
- STAGES OF HEMOSTASIS
  - VASOCONSTRICTION
  - FORMATION OF PLATELET PLUG
  - COAGULATION OF BLOOD

DEFINITION

Hemostasis is defined as a process during which bleeding from an injured blood vessel is arrested or stopped.

STAGES OF HEMOSTASIS

During injury of a blood vessel, series of reactions takes place leading to hemostasis. Injury itself initiates the reactions.

During injury, **endothelium** of blood vessel is damaged and the **collagen** is exposed. Platelets adhere to this collagen and get activated. Adherence of platelets to collagen is accelerated by **von Willebrand factor (Fig. 17.1)**. This factor acts as a bridge between a specific glycoprotein present on the surface of platelet and collagen fibrils. Activated platelets induce hemostasis.

Hemostasis occurs in **three stages**:

1. Vasoconstriction.
2. Platelet plug formation.
3. Coagulation of blood.

1. VASOCONSTRICTION

Immediately after injury, the blood vessel constricts and decreases loss of blood from damaged portion. Usually, arterioles and small arteries constrict. Vasoconstriction is purely a **local phenomenon**.

When the blood vessels are cut, the endothelium is damaged and the collagen is exposed. Platelets adhere to this collagen and get activated. Activated platelets secrete **serotonin** and other vasoconstrictor substances like thromboxane A_2 which cause constriction of the blood vessels **(Fig. 17.1)**.

2. FORMATION OF PLATELET PLUG

Platelets adhered to collagen of ruptured blood vessel secrete **adenosine diphosphate** (ADP) and **thromboxane A2** which attract more and more platelets and activate them. All the platelets aggregate together and form a loose temporary **platelet plug** or temporary **hemostatic plug**. This closes the ruptured vessel and prevents further blood loss.

Platelet aggregation is accelerated by platelet-activating factor (PAF). If platelet plug is unable to stop bleeding completely, third stage of coagulation of blood starts.

3. COAGULATION OF BLOOD

During this process, **fibrinogen** is converted into **fibrin**. Fibrin threads get attached to loose platelet plug, which blocks the ruptured part of blood vessels. This process prevents further blood loss completely. Mechanism of blood coagulation is explained in the next chapter.

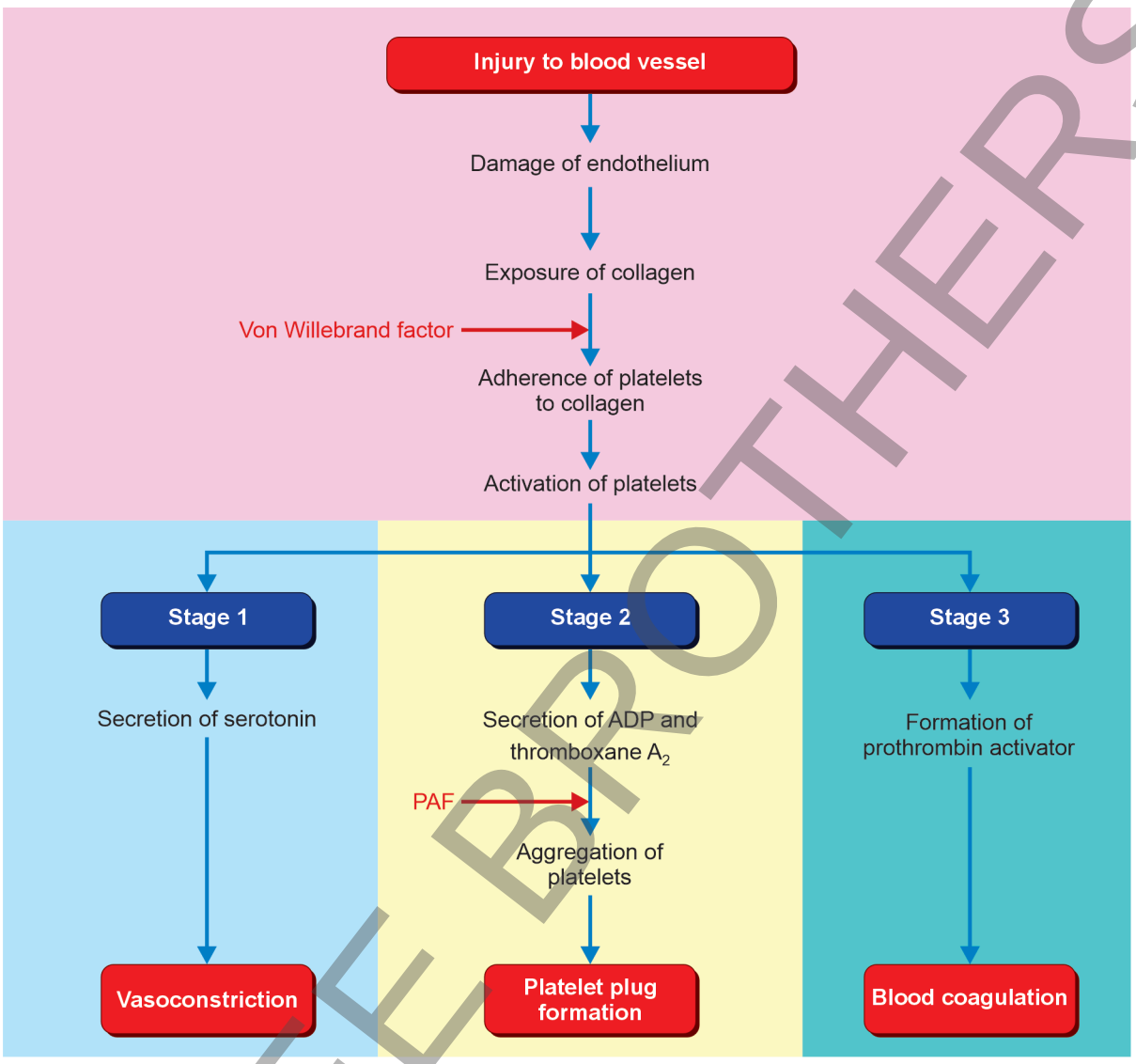

FIGURE 17.1: Stages of hemostasis.
ADP = Adenosine diphosphate, PAF = Platelet-activating factor.

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K Sembulingam PhD is a renowned person in the field of Physiology. He has a long and vast experience of teaching Physiology to undergraduate and postgraduate medical students in various institutions in India and abroad. He had served MR Medical College, Kalaburagi, Karnataka, India; Sri Ramachandra Medical College and Research Institute, Chennai, Tamil Nadu, India; School of Health Sciences, Universiti Sains Malaysia, Kelantan, Malaysia; Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry, India; Sri Manakula Vinayagar Medical College and Hospital, Puducherry; Shri Sathya Sai Medical College and Research Institute, Nellikuppam, Tamil Nadu; and Madha Medical College and Research Institute, Chennai, Tamil Nadu. Currently, he is working as visiting professor at Datta Meghe Medical College, Nagpur, and Datta Meghe Institute of Higher Education & Research (Deemed to be University, Wardha, Maharashtra, India.

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