THE LUCITE CALVARIUM—A METHOD FOR DIRECT
OBSERVATION OF THE BRAIN

II. CRANIAL TRAUMA AND BRAIN MOVEMENT*

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(Received for publication August 16, 1946)

INTRODUCTION

I N A PREVIOUS report23 an experimental surgical technic in which the convex
portion of the monkey skull is replaced by a transparent lucite calvarium
was described. Because a large area of both cerebral hemispheres is ex-
posed through the lucite window, the method is ideally suited for the study
of intracranial phenomena under “closed box” conditions. It may be of
interest to mention that the technic was developed primarily to study the
effects of cranial trauma on the underlying brain. The patterns of brain
motion resulting from blows to both the freely movable and the immobile
head were recorded by high-speed cinematography.

It is stressed that these experiments were conducted to study the motion
patterns of the cerebral mass and any other visible physical change. It is
not a study of cerebral concussion. Although brain movement and concussion
are probably closely interrelated the mechanism of concussion is not explain-
able in the light of our findings. It is hoped, however, that this study may
furnish additional data toward the eventual solution of the problem of cere-
bral concussion.

HISTORICAL BACKGROUND

A review of the literature of the past century and a half discloses that the
efforts of investigators have been directed principally toward explaining the
phenomenon of concussion. Comparatively few studies have been under-
taken with a primary objective of explaining the mechanics involved in the
production of focal and contrecoup brain injury. In establishing the historical
background for this presentation these studies of cerebral movement and
damage are emphasized. Reference to studies of concussion is made only in-
sofar as these studies contribute to the subject under discussion. Excellent
reviews of the development of our current knowledge of cerebral concussion
may be found in the writings of Polis,20 Miller,18 Denny-Brown and Russell,7
and Denny-Brown.6

According to Polis,20 Fallopius was first to describe cerebral damage on
the side of the brain opposite the site of impact. However, the term “contre-
Fig. 1. Theories concerning the mechanism of coup and contrecoup cerebral damage. The skull deformation shown in the diagram representing the theory of transmitted waves of force has not been described in all of the writings on this theory but is included for the sake of simplicity.