EDGEWOOD ARSENAL
TECHNICAL REPORT

FATR 4626

ATLAS OF GOAT ANATOMY

PART II: SERIAL CROSS SECTIONS

by

Clarence E. Hopkins, Sr.
Thomas E. Hamm, Jr., CPT, VC
Gary L. Leppart

April 1972

DEPARTMENT OF THE ARMY
EDGEWOOD ARSENAL
Biomedical Laboratory
Edgewood Arsenal, Maryland 21010

65

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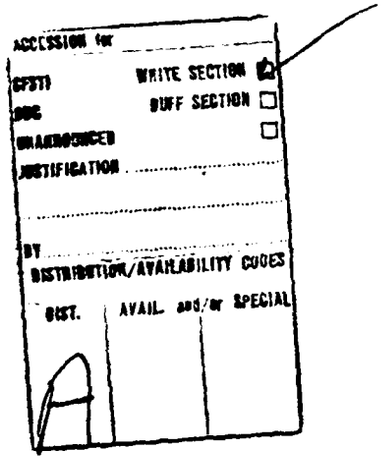

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13. ABSTRACT

The angora goat (Capra hircus) has been the main experimental animal used by the Biophysics Division for many years. Knowledge of goat anatomy is important during both the planning and experimental stages of projects. Because no readily usable information on goat anatomy is available, a series of reports on the subject is being prepared. The first in the series described the skeletal anatomy. The present report contains serial cross sections of the angora goat. Part III, Myology, which will describe the muscles on superficial and deep dissection of the head, neck, pectoral, and pelvic limbs, is near completion.

14. KEYWORDS

Atlas	Angora goat
Capra hircus	Serial cross sections
Embalmed	Nomina Anatomica Veterinaria
Meat cutting saw	Key figure
Cannula	Carotid artery
Jugular vein	Deep freeze

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Biophysics Division

April 1972

Task 1T061101A91A15

DEPARTMENT OF THE ARMY
EDGEWOOD ARSENAL
Biomedical Laboratory
Edgewood Arsenal, Maryland 21010

FOREWORD

The work described in this report was authorized under Task 1T061101A91A15, In-House Laboratory Independent Research. This work was started in September 1965 and completed in February 1971.

In conducting the research described in this report, the investigators adhered to the "Guide for Laboratory Animal Facilities and Care," as promulgated by the Committee on the Guide for Laboratory Animal Resources, National Academy of Sciences–National Research Council.

Acknowledgments

The authors wish to acknowledge the technical assistance of William J. Kelly, John J. Holter, Bernard Meyers, Joseph B. Scott, and Garnet E. Affleck, Jr., in performing the photographic procedures.

DIGEST

The angora goat (Capra hircus) has been the main experimental animal used by the Biophysics Division for many years. Knowledge of goat anatomy is important during both the planning and experimental stages of projects. Because no readily usable information on goat anatomy is available, a series of reports on the subject is being prepared. The first in the series described the skeletal anatomy. The present report contains serial cross sections of the angora goat. Part III, Myology, which will describe the muscles on superficial and deep dissection of the head, neck, pectoral, and pelvic limbs, is near completion.

CONTENTS

ATLAS OF GOAT ANATOMY

PART II: SERIAL CROSS SECTIONS

I. INTRODUCTION.

The angora goat (Capra hircus) has been the main experimental animal used by the Biophysics Division, Edgewood Arsenal, Maryland, for many years. Knowledge of goat anatomy is important during both the planning and experimental stages of projects. Because no readily usable information on goat anatomy is available, a series of reports on the subject is being prepared. The first in the series[1] described the skeletal anatomy. The present report contains serial cross sections of the angora goat. Part III, Myology, which will describe the muscles on superficial and deep dissection of the head, neck, pectoral, and pelvic limbs, is near completion.

II. MATERIALS AND METHODS.

A polyethylene cannula (0.106-inch ID and 0.138-inch OD) containing a plug was placed in the jugular vein of an uncastrated adult angora goat and the animal was anesthetized with pentobarbital sodium. The goat was then suspended in a metal frame by ropes attached to the horns, tail, and nuchal ligament with its feet just touching the floor of the frame (figure 1). [This was done so that later the goat, suspended in the stand, could be frozen in that position (figure 2). Cross sections from an earlier castrated goat, frozen while lying on its side, were distorted and had to be discarded.]

The goat was then exsanguinated through an additional cannula placed in the carotid artery on the opposite side of the neck. As blood flow ceased, the carotid cannula was connected to a large funnel which was suspended several feet above the goat and contained 1% gum arabic solution. The plug in the jugular cannula was removed, and the animal was perfused through this gravity flow system with 12,000 ml of the gum arabic solution until the fluid coming out of the jugular cannula was clear. Then 12,000 ml of 10% formalin solution was allowed to flow slowly through the system until the exiting fluid had a distinct formalin odor.

The goat remained in the frame at room temperature until the next day. At that time, 250 ml of red latex was injected into the carotid artery via the cannula and 300 ml of blue latex was injected into the jugular vein. The cannula plugs were replaced and the animal was placed in a deep freeze. After 5 days, the goat was removed and sectioned longitudinally, beginning at the anterior end, at 1-inch intervals (54 sections) with a meat cutting saw. Each section was photographed, and drawings were made from the photographs.

A "key figure" for reference was drawn and marked in 1-inch sections (figure 3).

Another castrated adult male angora goat was prepared in the same way as the first and sectioned at the median plane. The labeled photograph is shown in figure 4. The drawings of the 54 longitudinal cross sections follow figure 4.

The nomenclature prescribed in Nomina Anatomica Veterinaria[2] was used for labeling the drawings. The anatomy books of Sisson and Grossman[3] and May[4] and the excellent book by Miller[5] were also used as references during preparation of this atlas.

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[1]Hopkins, Clarence E., Sr., Hamm, Thomas E., Jr., and Leppart, Gary L. EATR 4431. Atlas of Goat Anatomy. Part I. Osteology. September 1970. UNCLASSIFIED Report.

[2]Nomina Anatomica Veterinaria. Department of Anatomy, New York State Veterinary College, Ithaca, New York. 1968.

[3]Sisson, S., and Grossman, J. D. Anatomy of Domestic Animals. 4th Ed. W. B. Saunders Company, Philadelphia, Pennsylvania. 1953.

[4]May, N. Anatomy of Sheep. 2d Ed. University of Queensland Press, Wilke Company, Australia. 1964.

[5]Miller, M. E., Christensen, G. C., and Evans, H. E. Anatomy of the Dog. W. B. Saunders Company, Philadelphia, Pennsylvania. 1964.

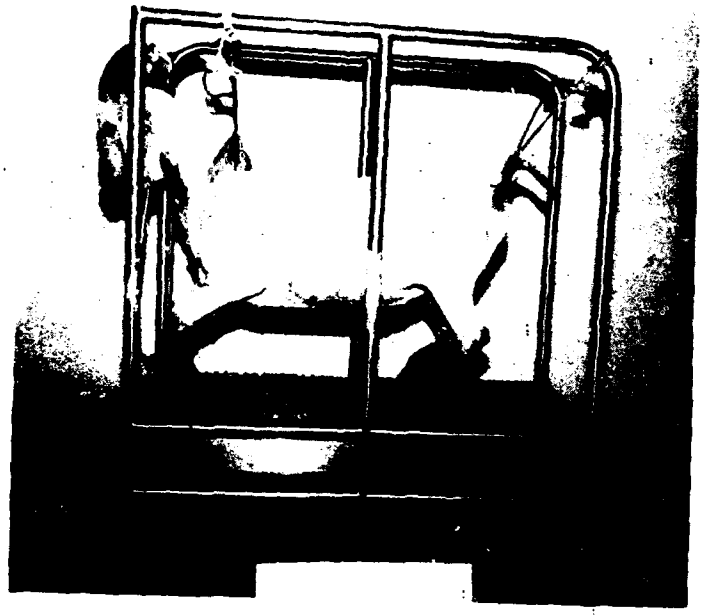


Figure 1. Goat Suspended by Rope in Metal Frame

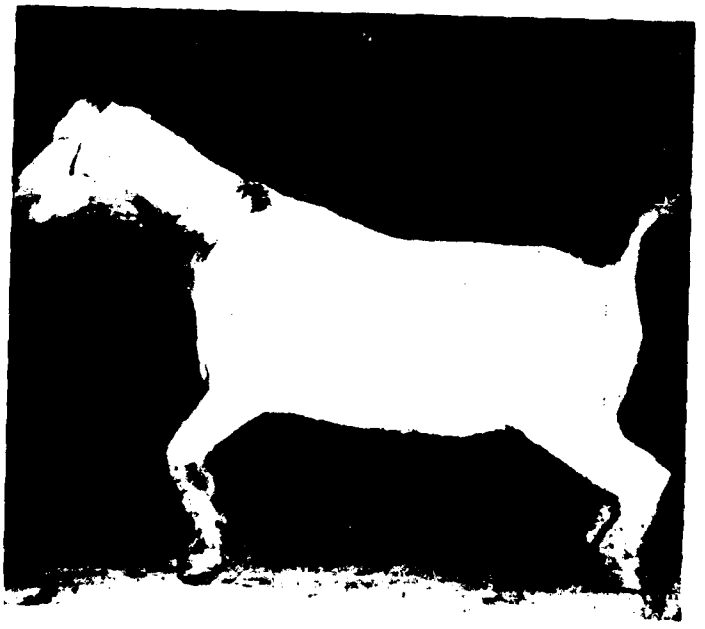


Figure 2. Embalmed Goat in Standing Position

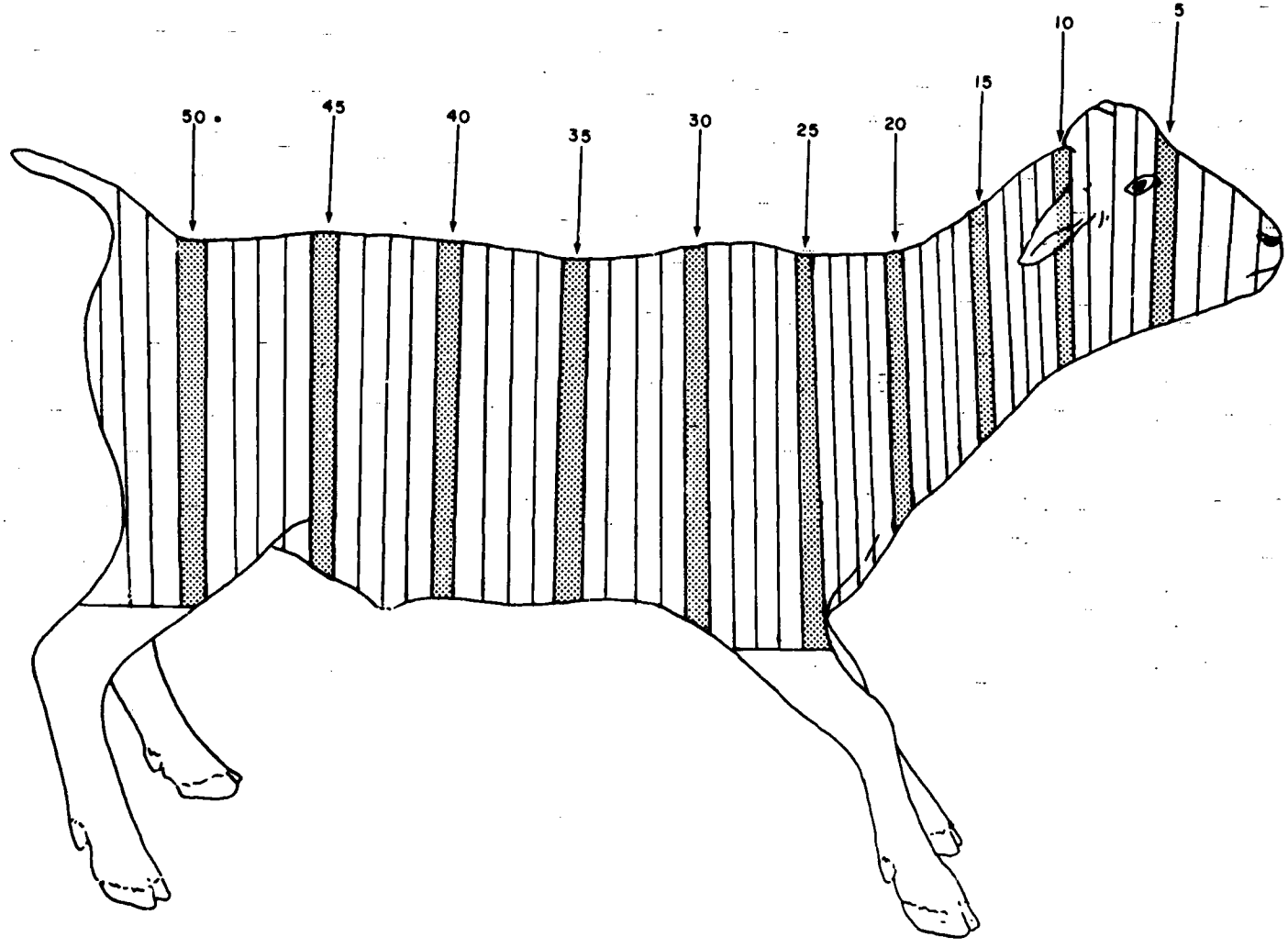


Figure 3. Key Figure: Cross Sections

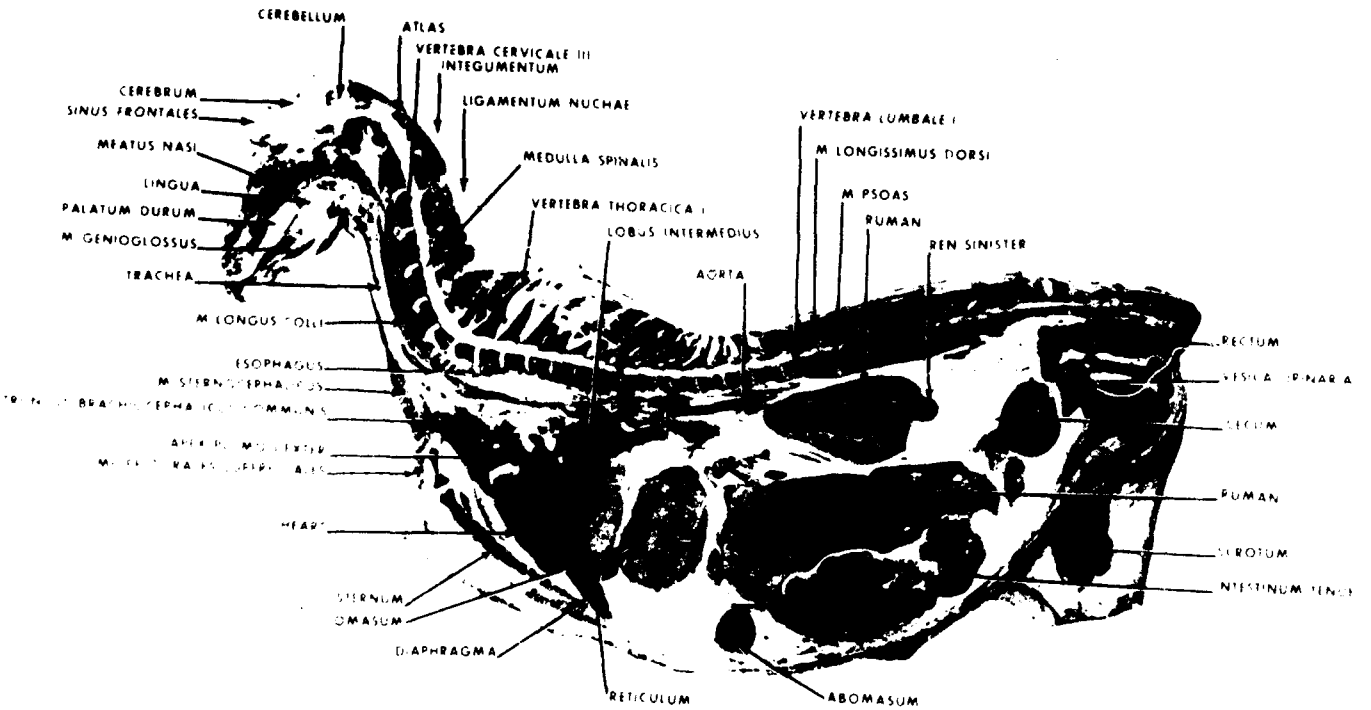
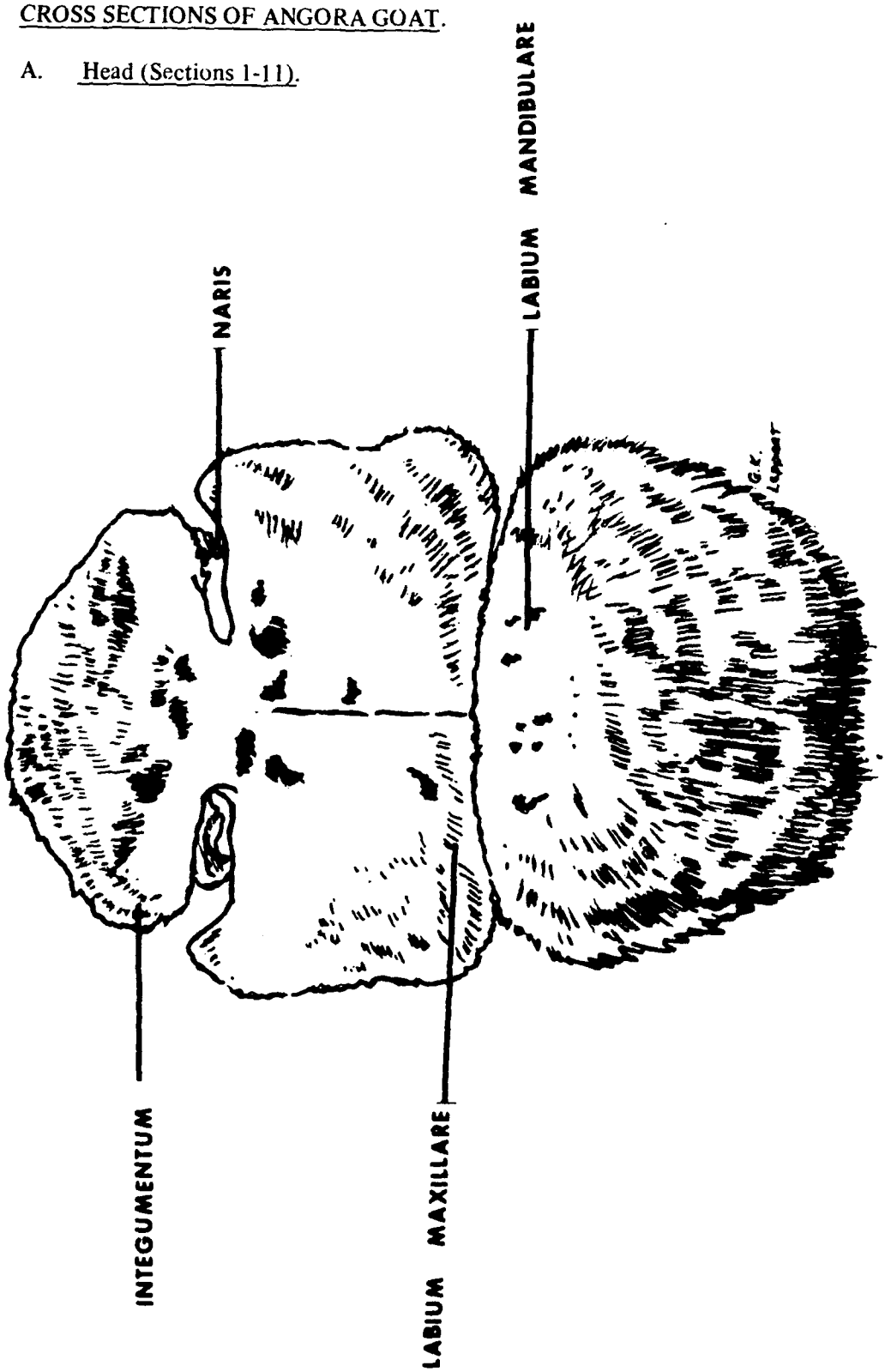


Figure 4. Median Plane

III. CROSS SECTIONS OF ANGORA GOAT.

A. Head (Sections 1-11).



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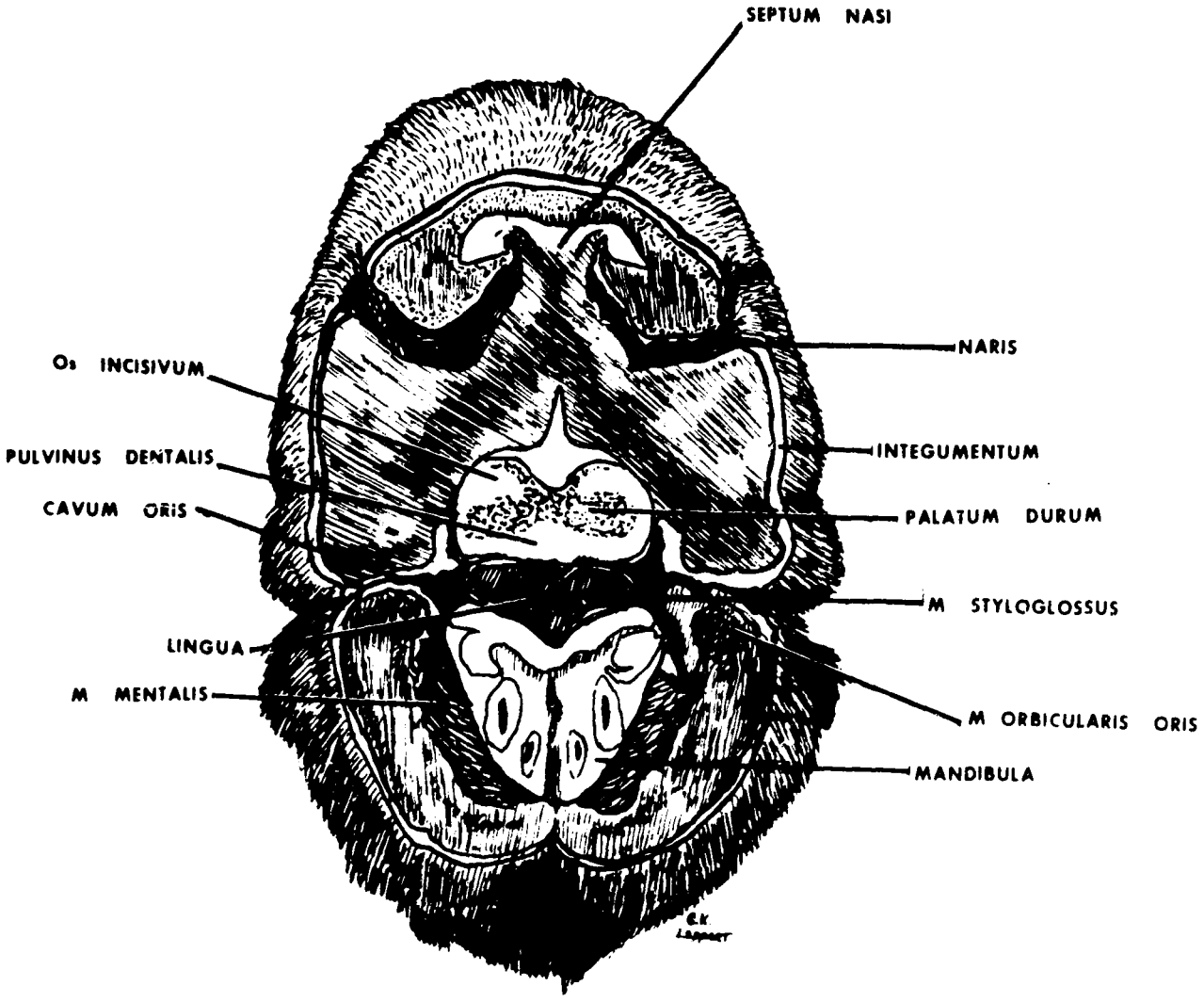
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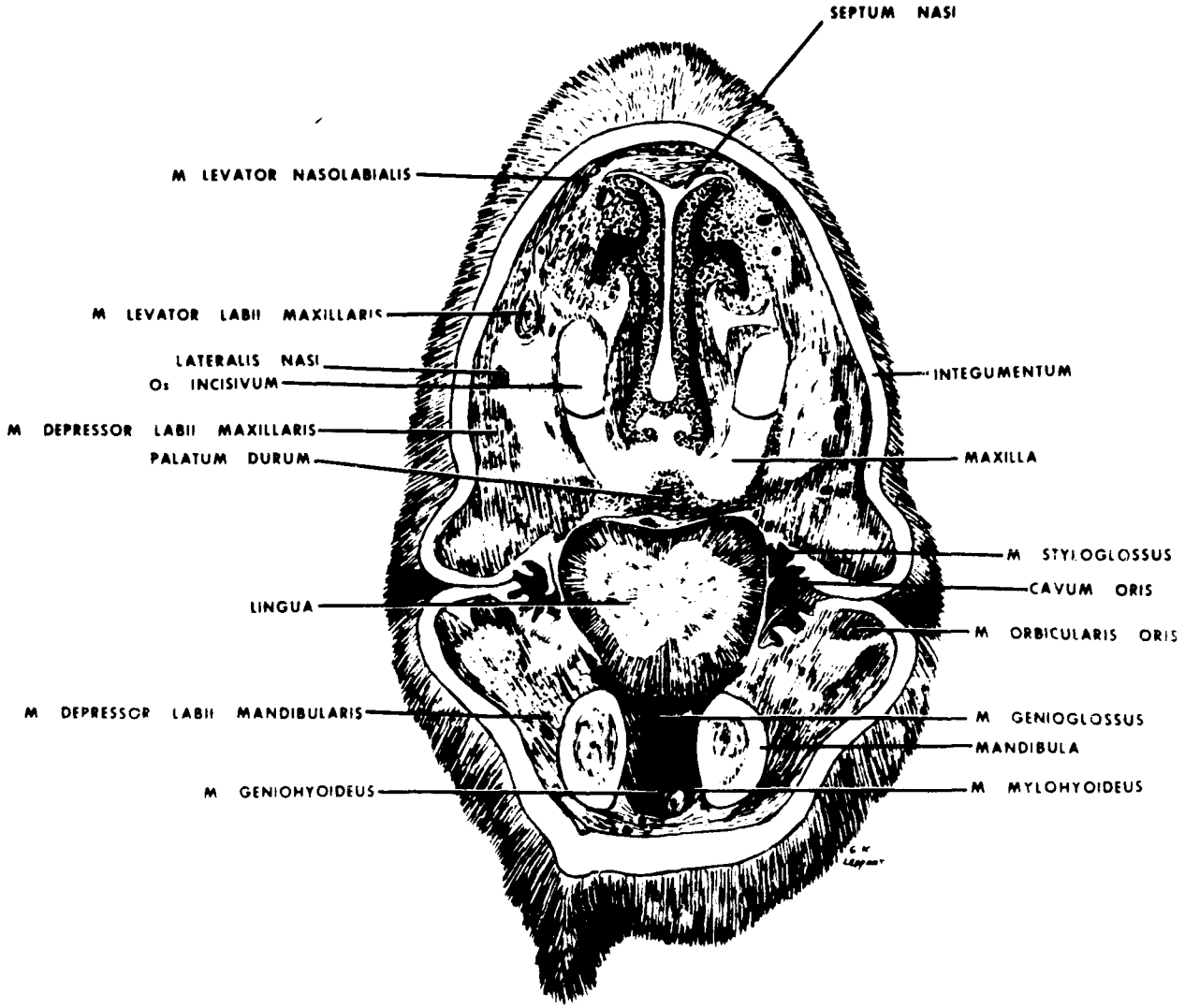
NARIS
Os INCISIVUM
INTEGUMENTUM
PULVINUS DENTALIS
PALATUM DURUM
CAVUM ORIS
M STYLOGLOSSUS
LINGUA
M ORBICULARIS ORIS
M MENTALIS
MANDIBULA

Section No. 2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M LEVATOR NASOLABIALIS
M LEVATOR LABII MAXILLARIS
LATERALIS NASI
Os INCISIVUM
M DEPRESSOR LABII MAXILLARIS
PALATUM DURUM
LINGUA
M DEPRESSOR LABII MANDIBULARIS
M GENIOHYOIDEUS
INTEGUMENTUM
MAXILLA
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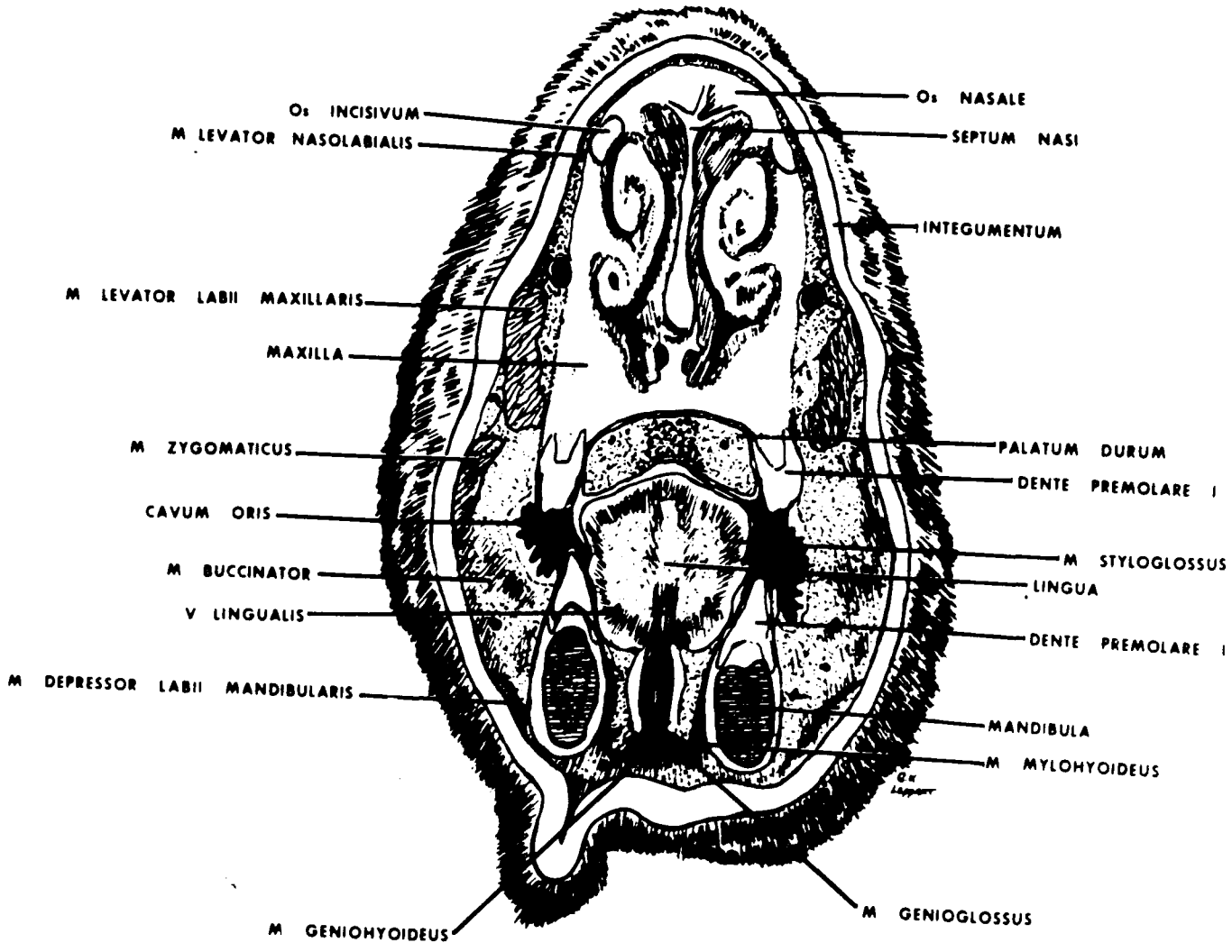
CAVUM ORIS
M ORBICULARIS ORIS
M GENIOGLOSSUS
MANDIBULA
M MYLOHYOIDEUS

Section No. 3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V LINGUALIS
M DEPRESSOR LABII MANDIBULARIS
M GENIOHYOIDEUS
Os NASALE
SEPTUM NASI
INTEGUMENTUM
PALATUM DURUM
DENTE PREMOLARE I
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LINGUA
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MANDIBULA
M MYLOHYOIDEUS
M GENIOGLOSSUS

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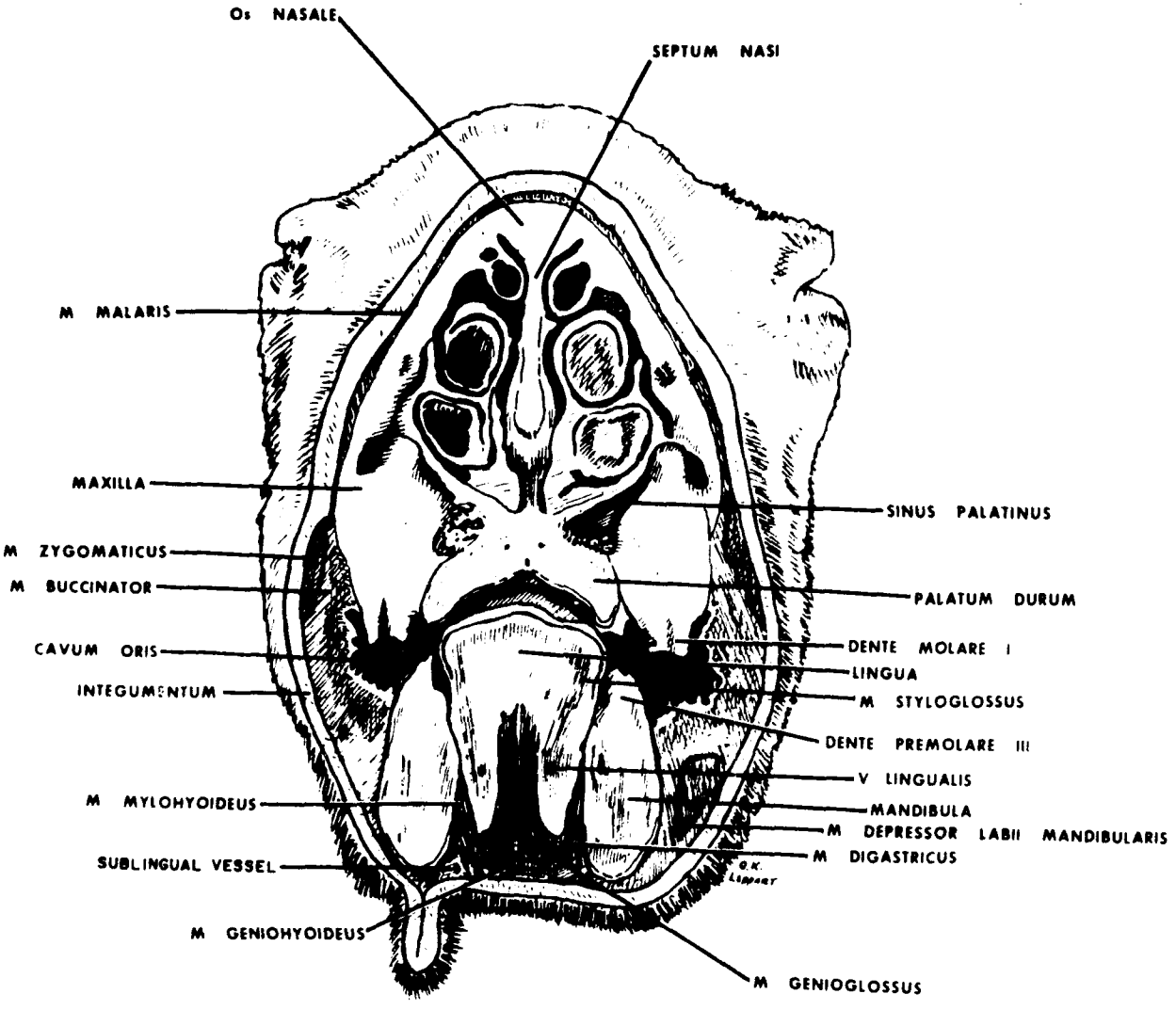
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MAXILLA
SINUS PALATINUS
M ZYGOMATICUS
M BUCCINATOR
PALATUM DURUM
CAVUM ORIS
DENTE MOLARE I
LINGUA
INTEGUMENTUM
M STYLOGLOSSUS
DENTE PREMOLARE III
V LINGUALIS
M MYLOHYOIDEUS
MANDIBULA
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M GENIOHYOIDEUS
M GENIOGLOSSUS

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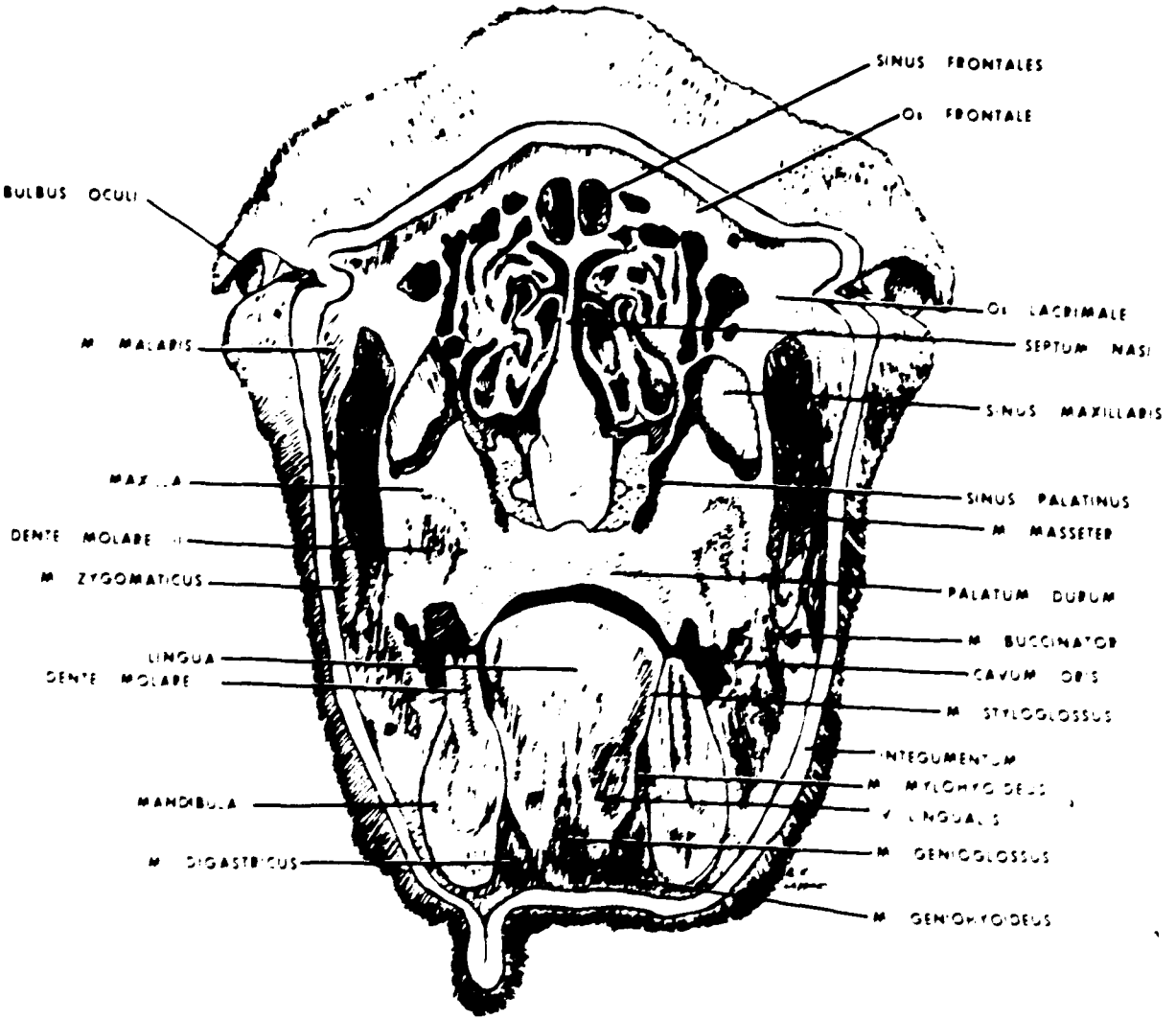
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Os FRONTALE
BULBUS OCULI
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SEPTUM NASI
SINUS MAXILLARIS
MAXILLA
SINUS PALATINUS
DENTE MOLARE
M MASSETER
M ZYGOMATICUS
PALATUM DURUM
M BUCCINATOR
LINGUA
CAVUM ORIS
DENTE MOLARE
M STYLOGLOSSUS
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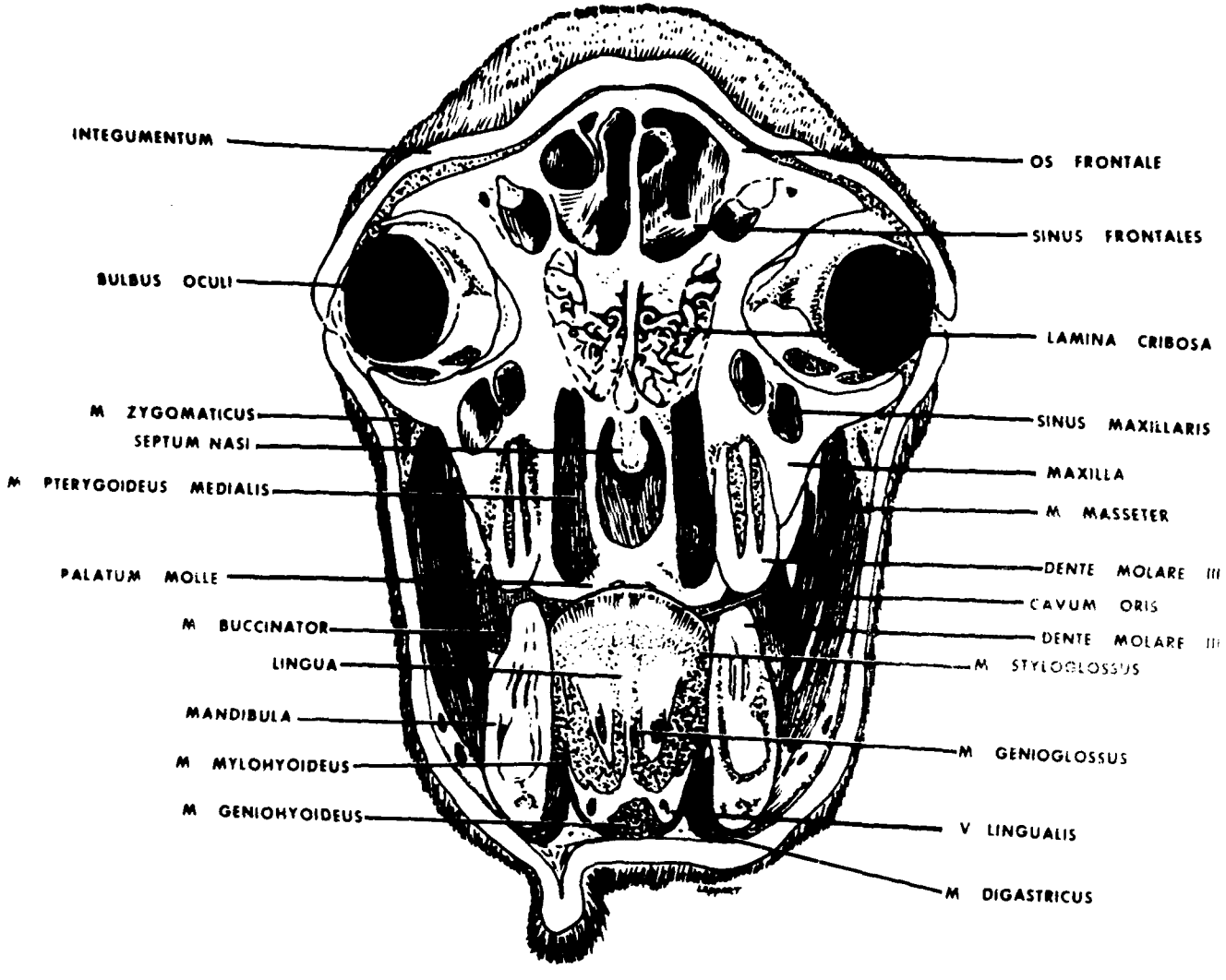
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BULBUS OCULI
M ZYGOMATICUS
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PALATUM MOLLE
M BUCCINATOR
LINGUA
MANDIBULA
M MYLOHYOIDEUS
M GENIOHYOIDEUS
OS FRONTALE
SINUS FRONTALES
LAMINA CRIBOSA
SINUS MAXILLARIS
MAXILLA
M MASSETER
DENTE MOLARE III
CAVUM ORIS
DENTE MOLARE III
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V LINGUALIS
M DIGASTRICUS

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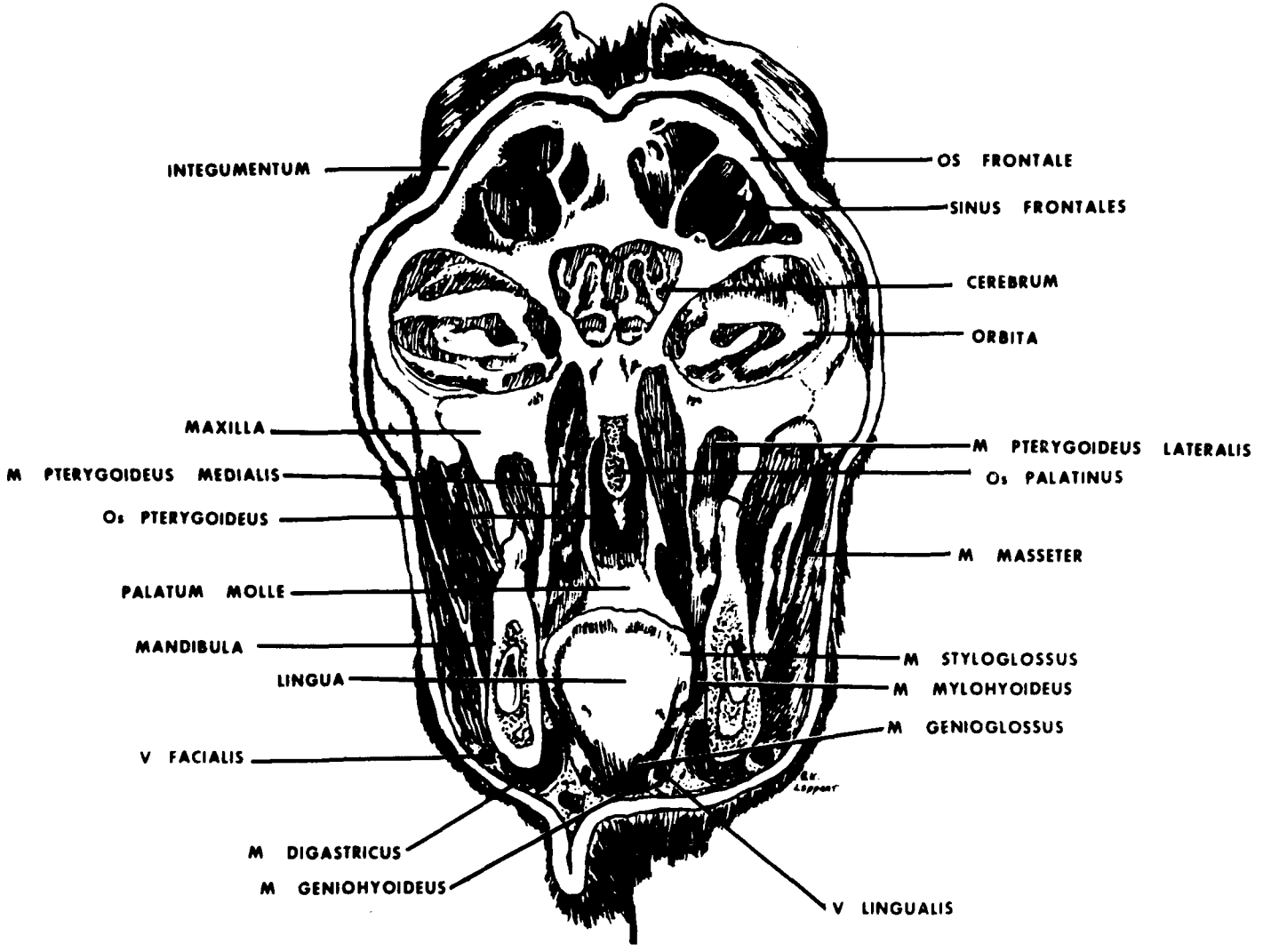
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CEREBRUM
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Os PALATINUS
Os PTERYGOIDEUS
M MASSETER
PALATUM MOLLE
MANDIBULA
M STYLOGLOSSUS
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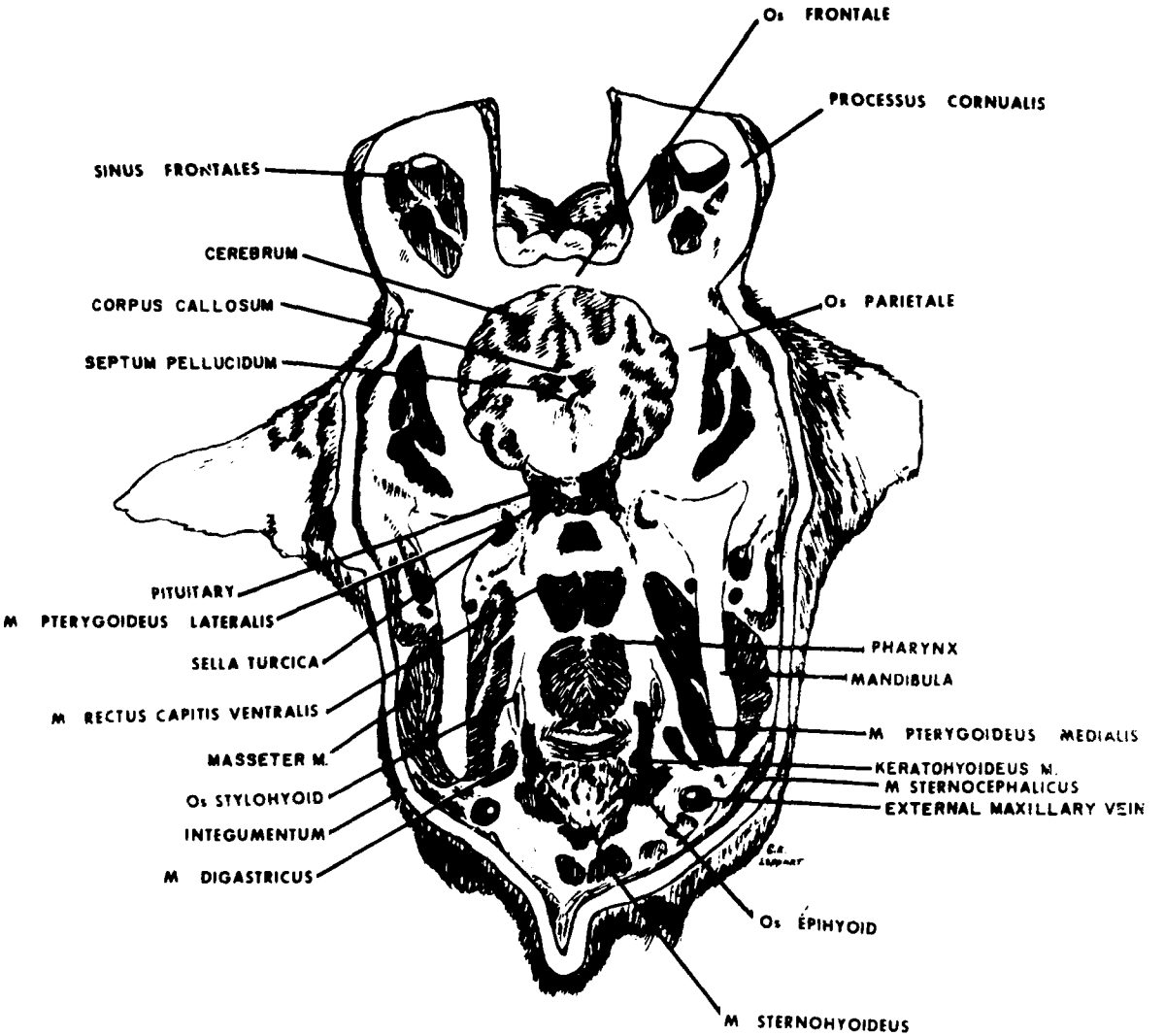
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CORPUS CALLOSUM
SEPTUM PELLUCIDUM
Os PARIETALE
PITUITARY
M PTERYGOIDEUS LATERALIS
SELLA TURCICA
M RECTUS CAPITIS VENTRALIS
MASSETER M.
Os STYLOHYOID
INTEGUMENTUM
M DIGASTRICUS
PHARYNX
MANDIBULA
M PTERYGOIDEUS MEDIALIS
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EXTERNAL MAXILLARY VEIN
Os EPIHYOID
M STERNOHYOIDEUS

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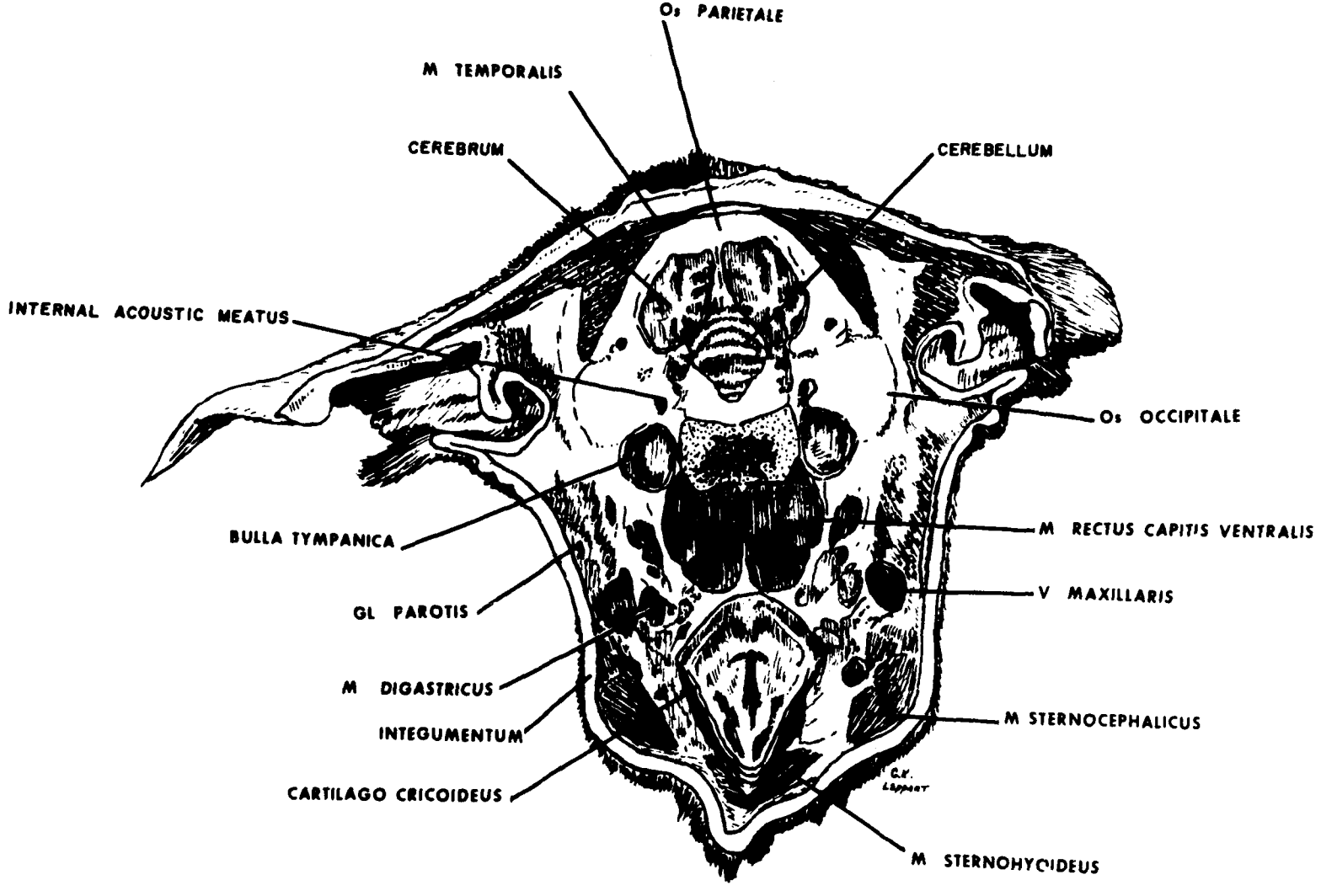

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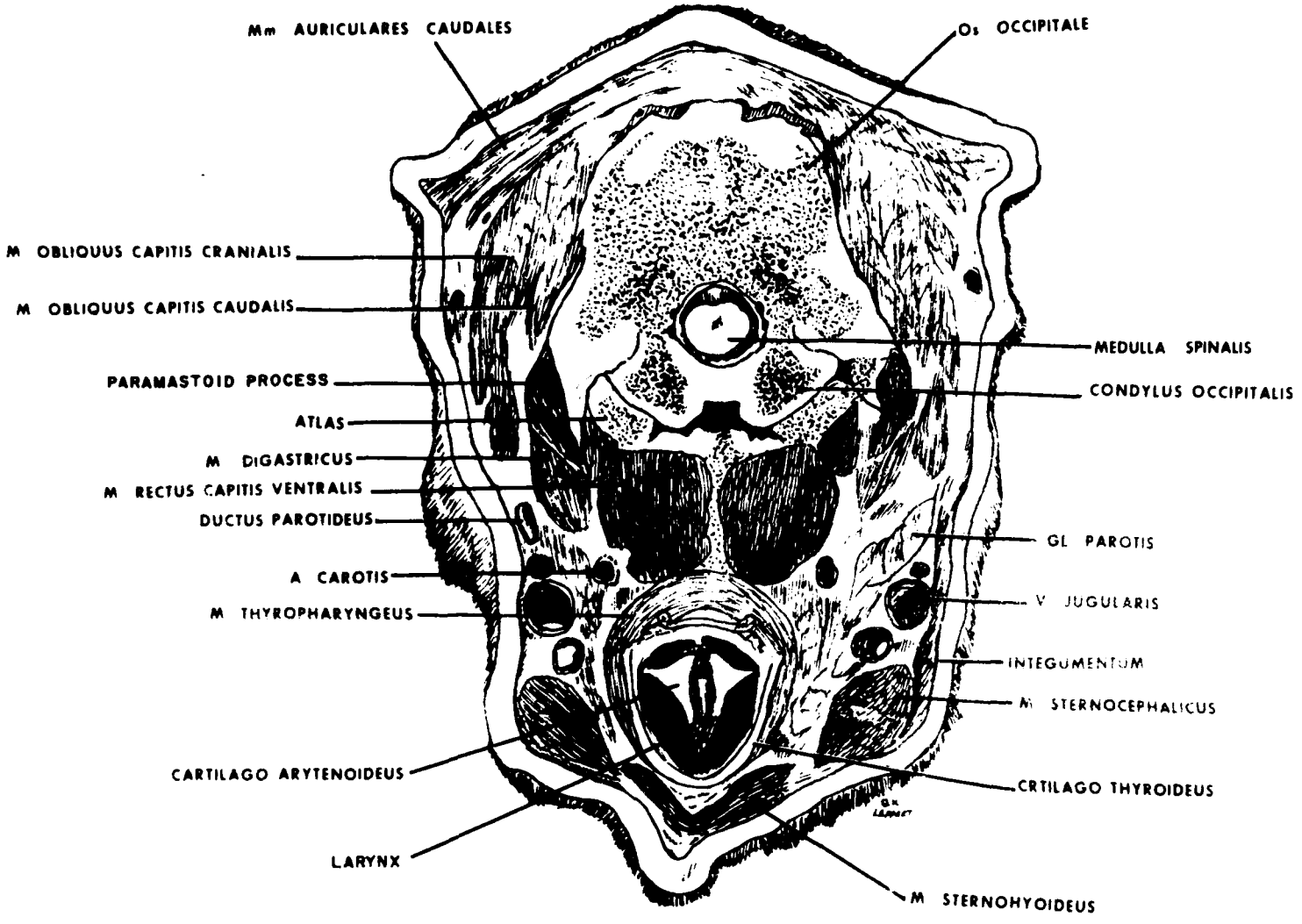

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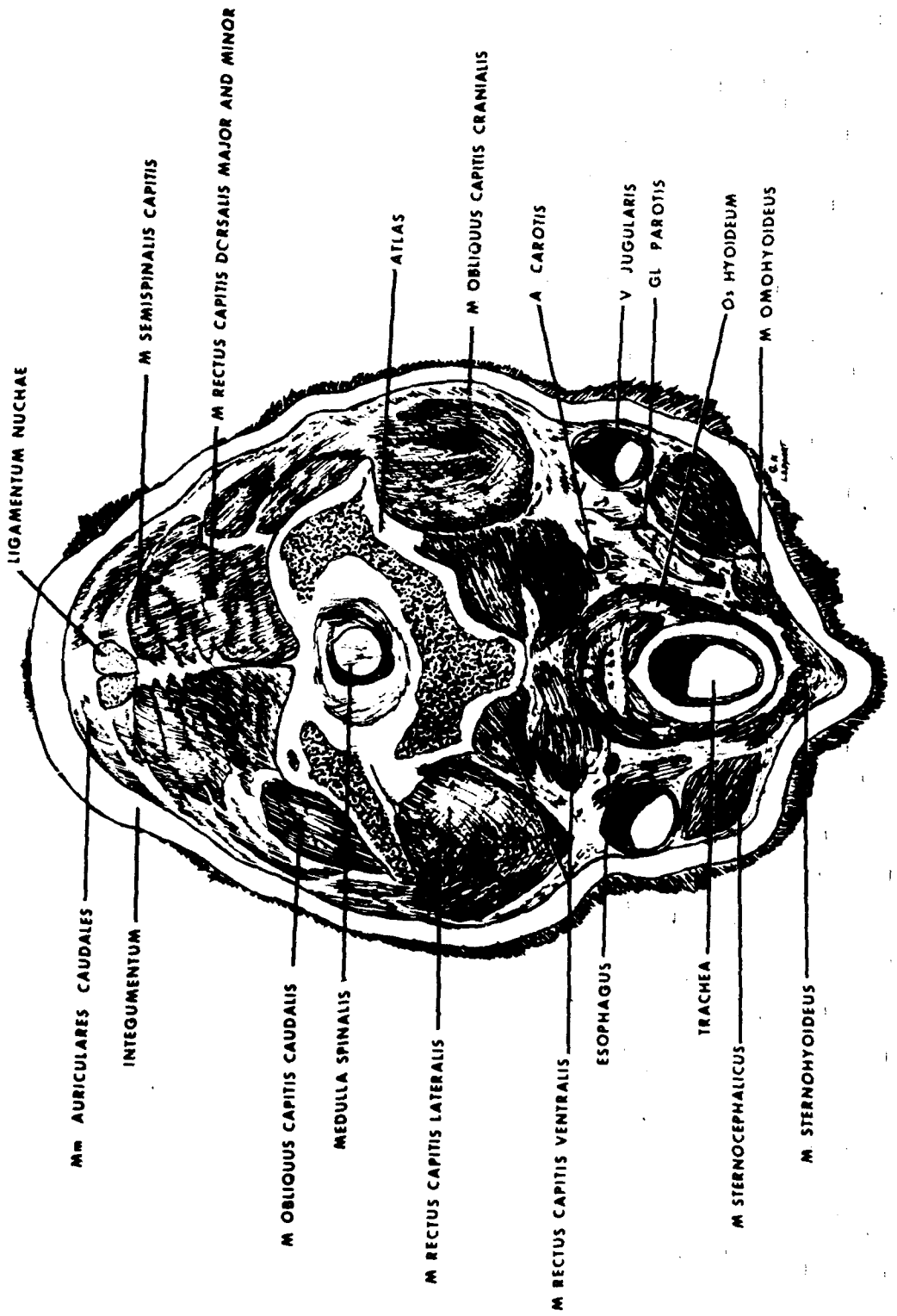
B. Neck (Sections 12-22).



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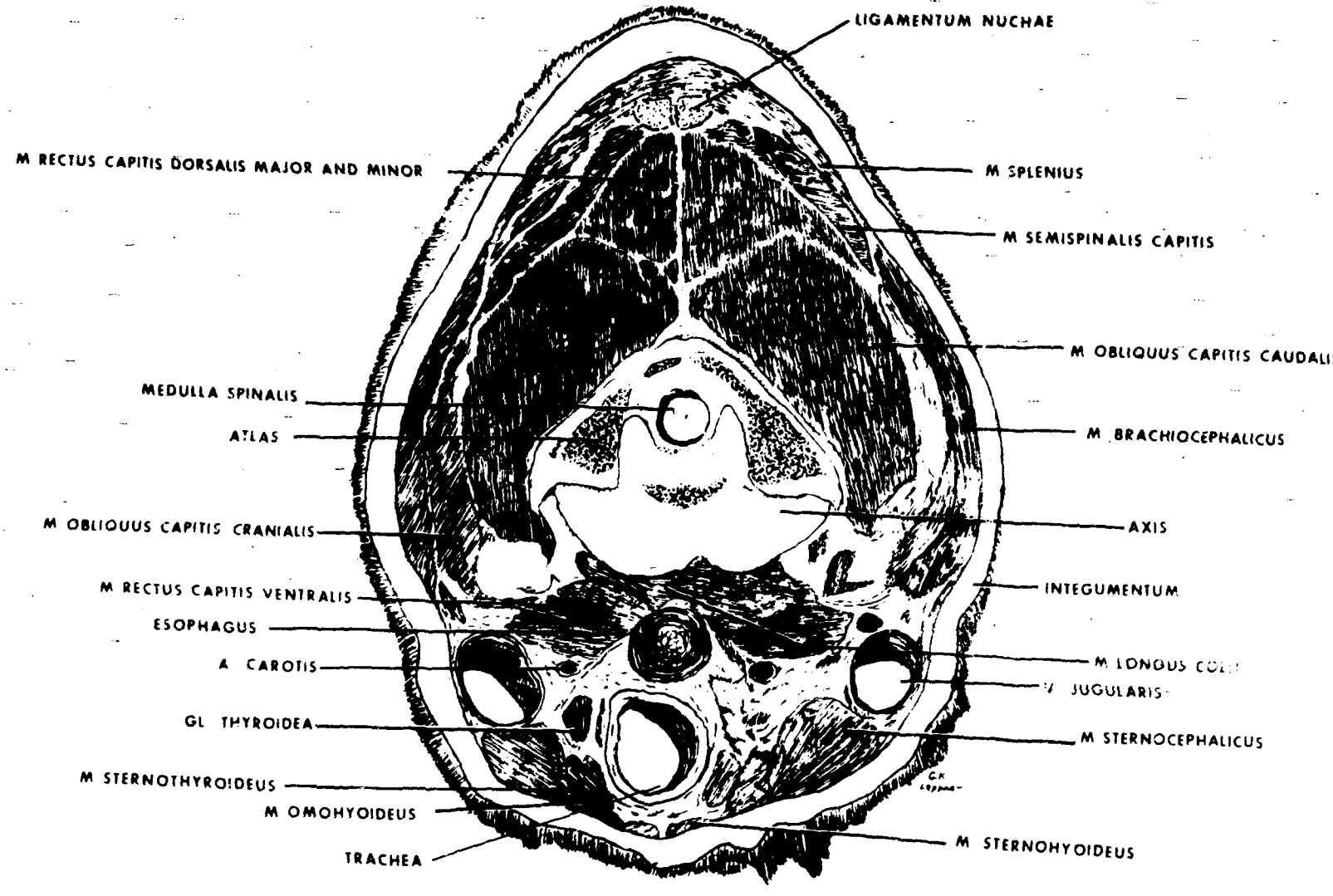

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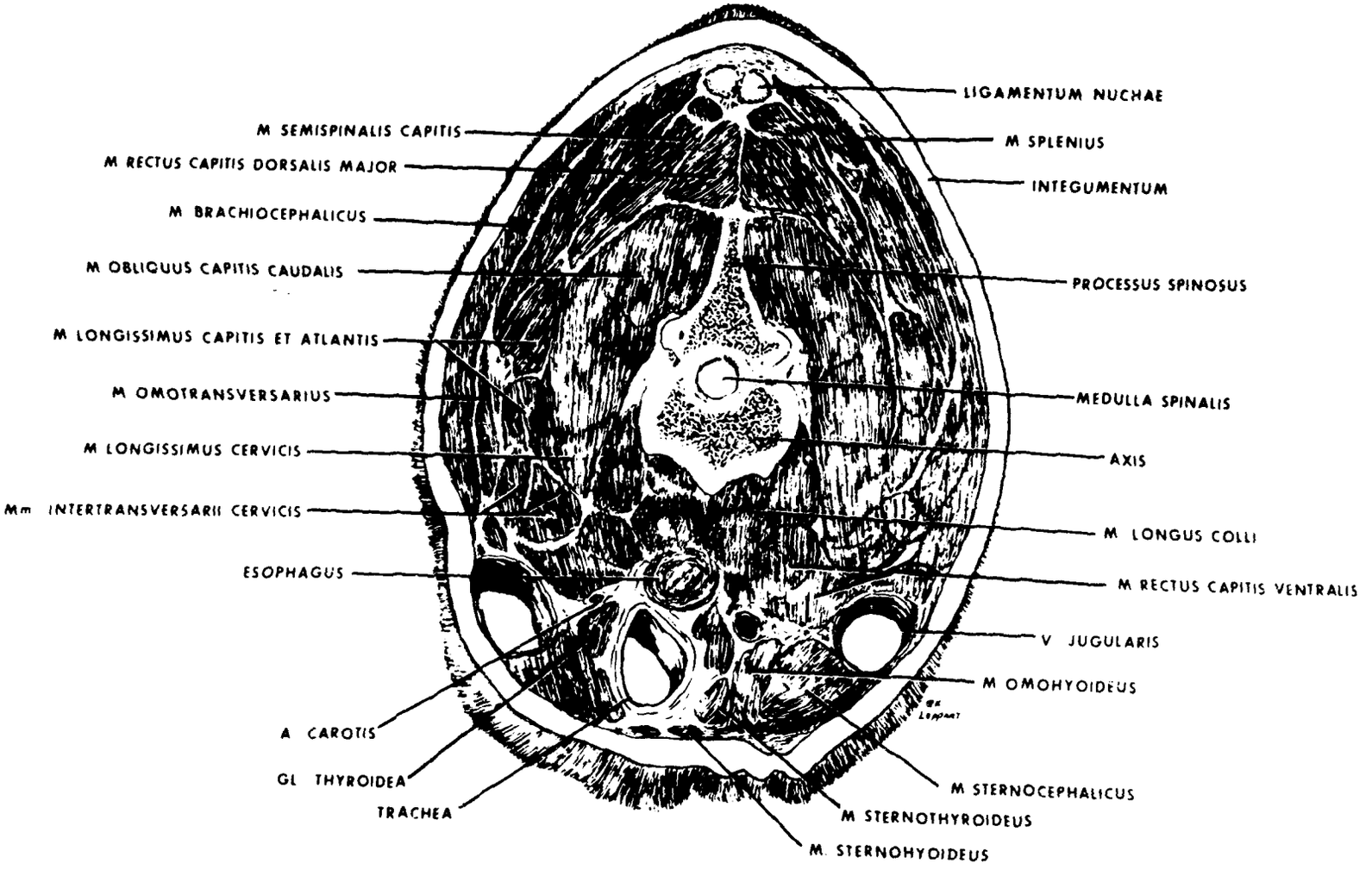

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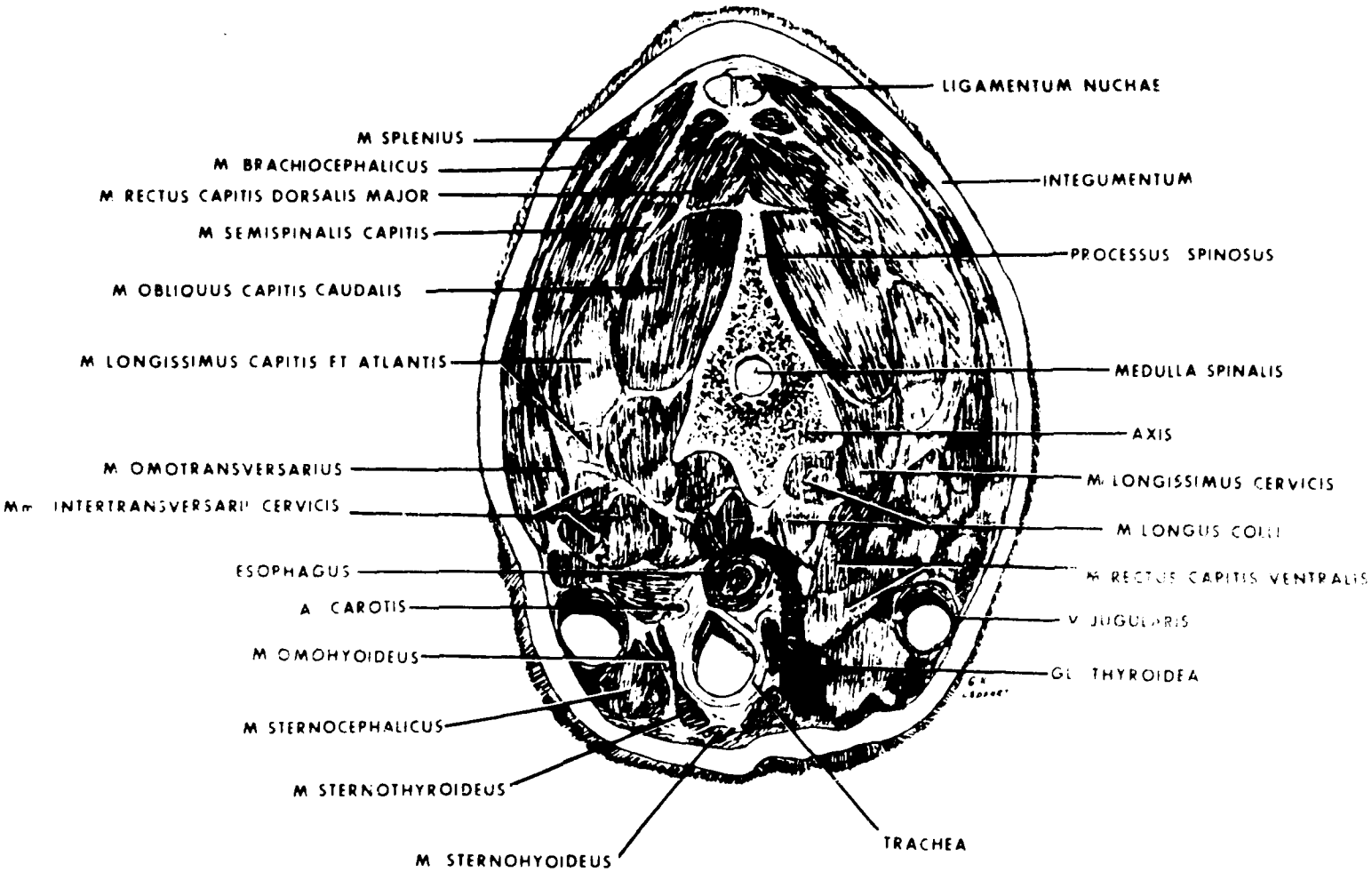

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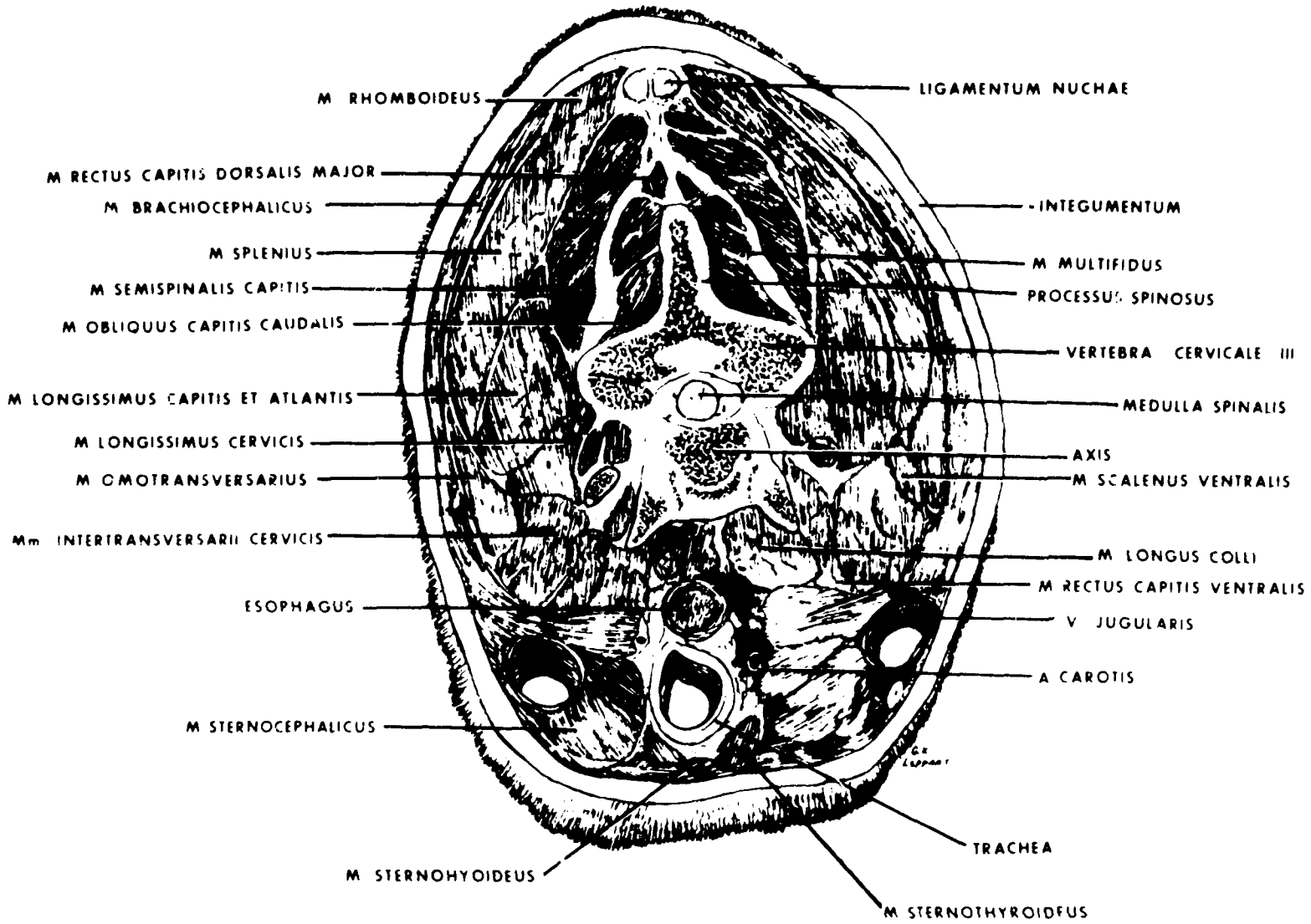

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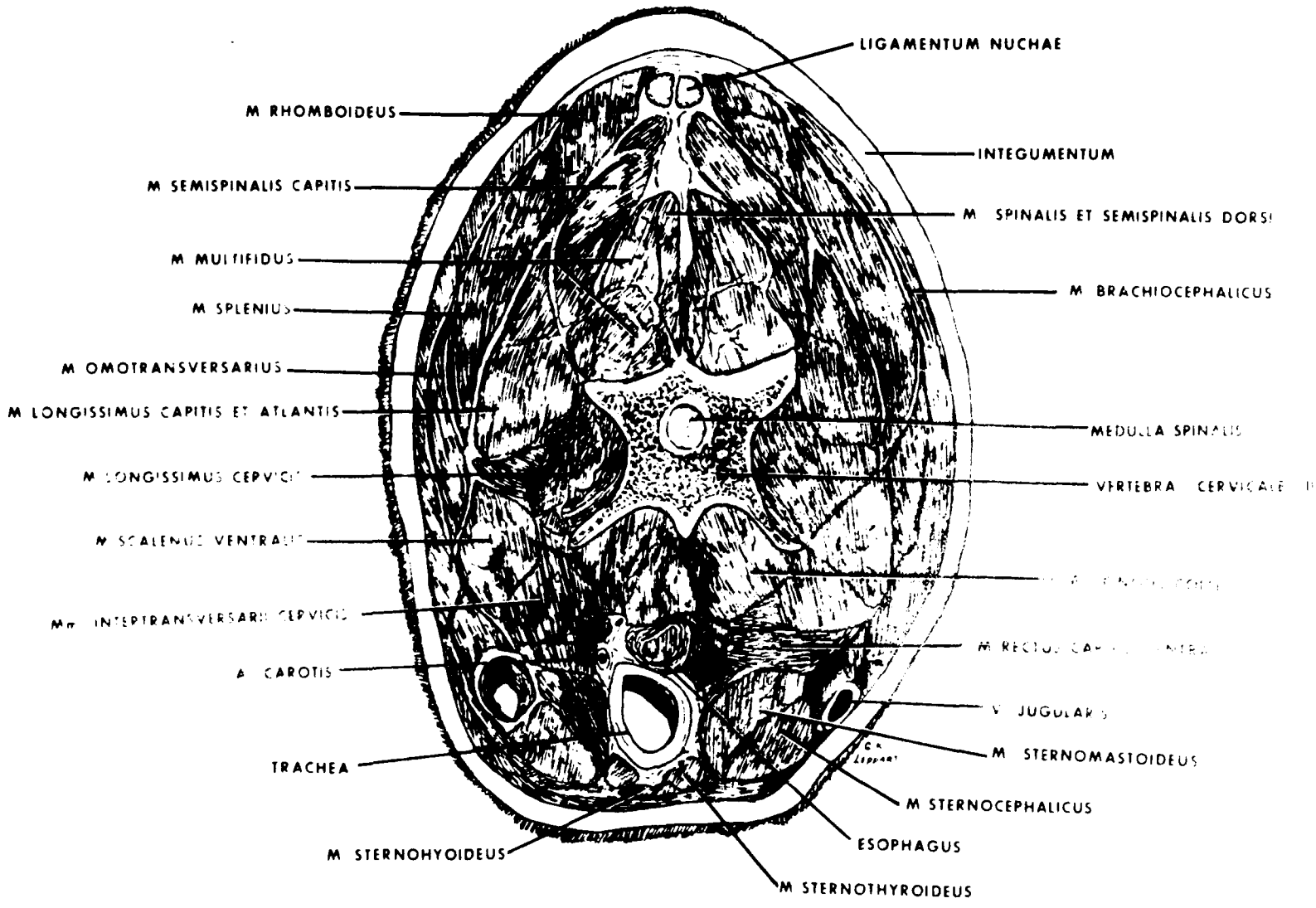

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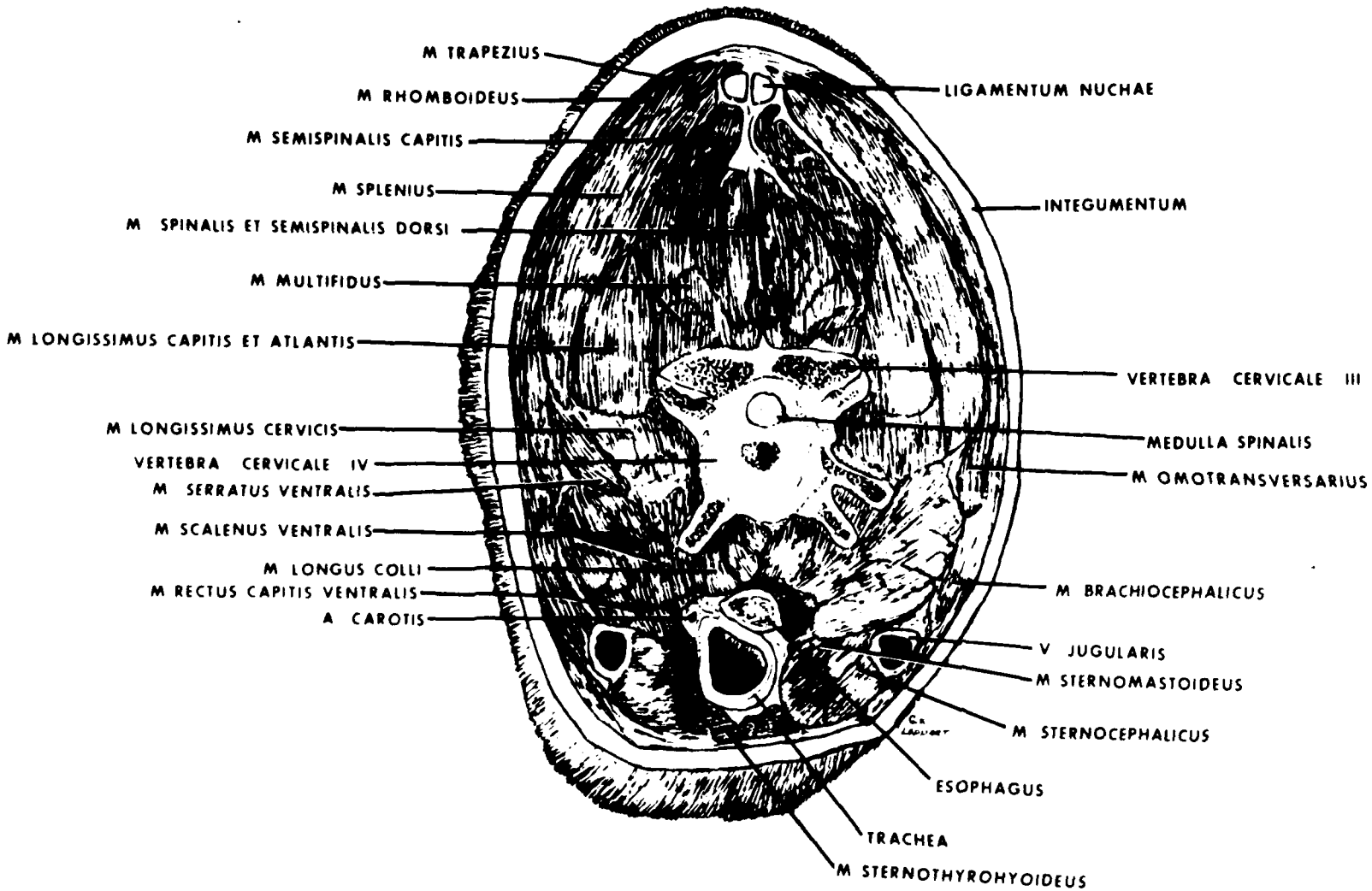

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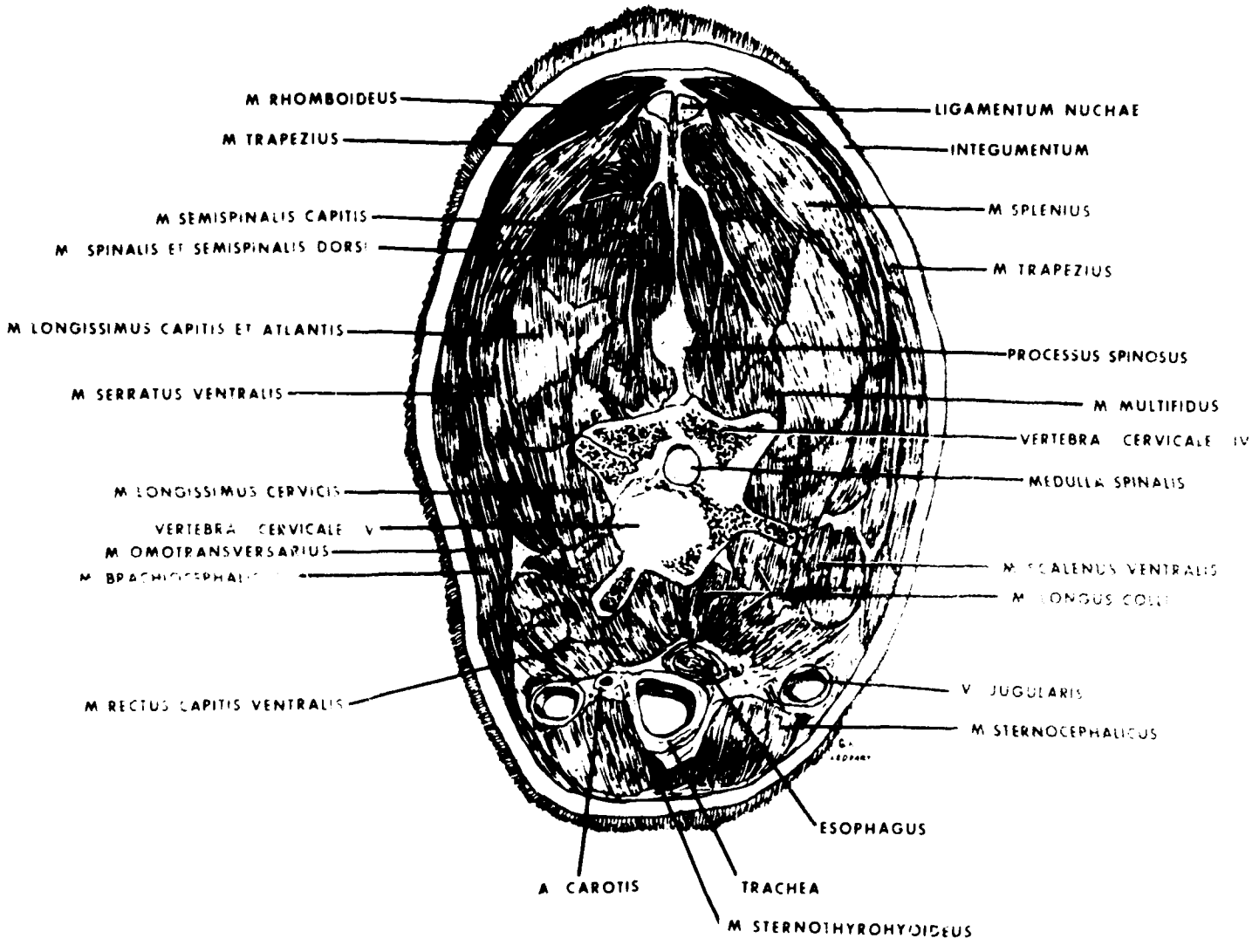

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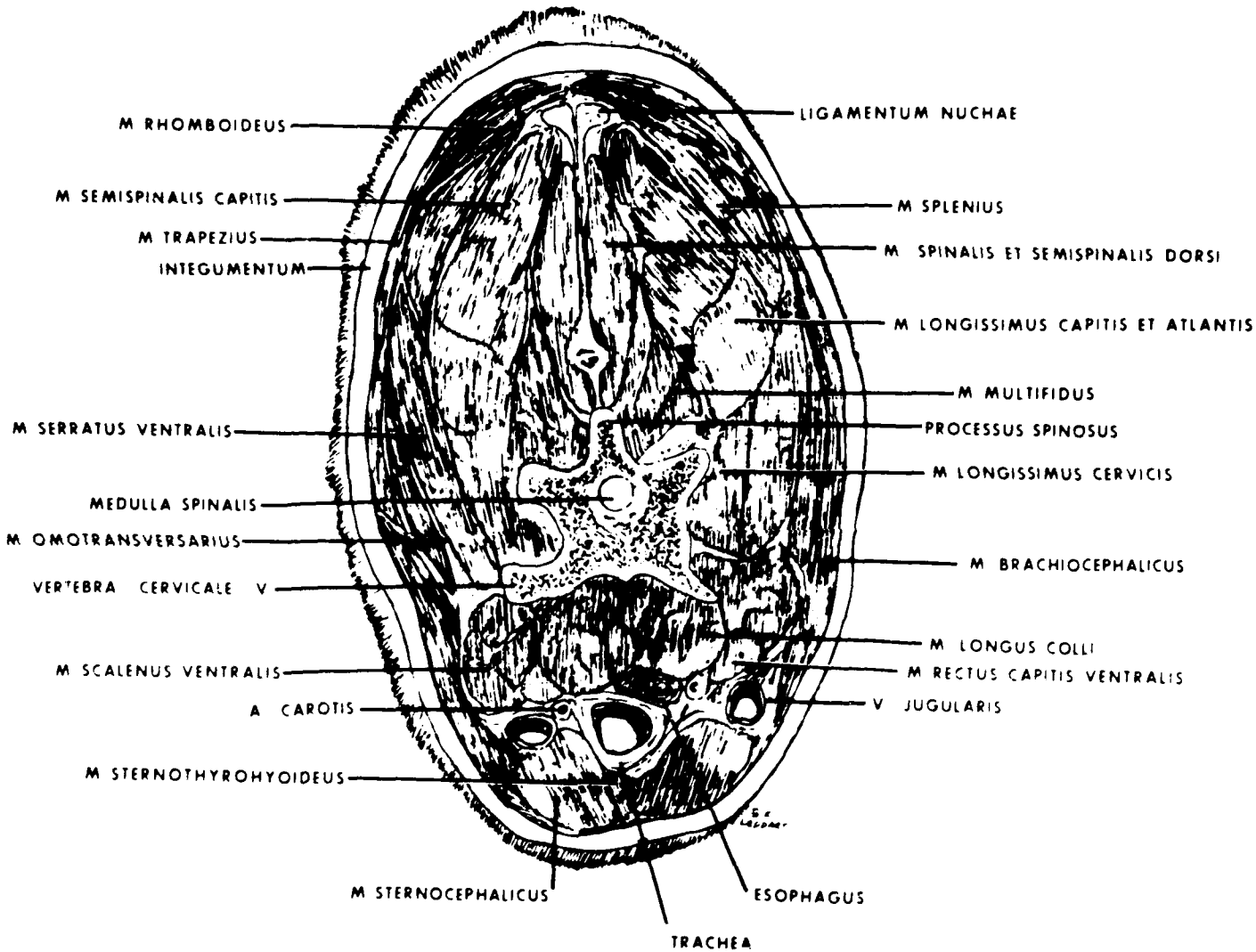

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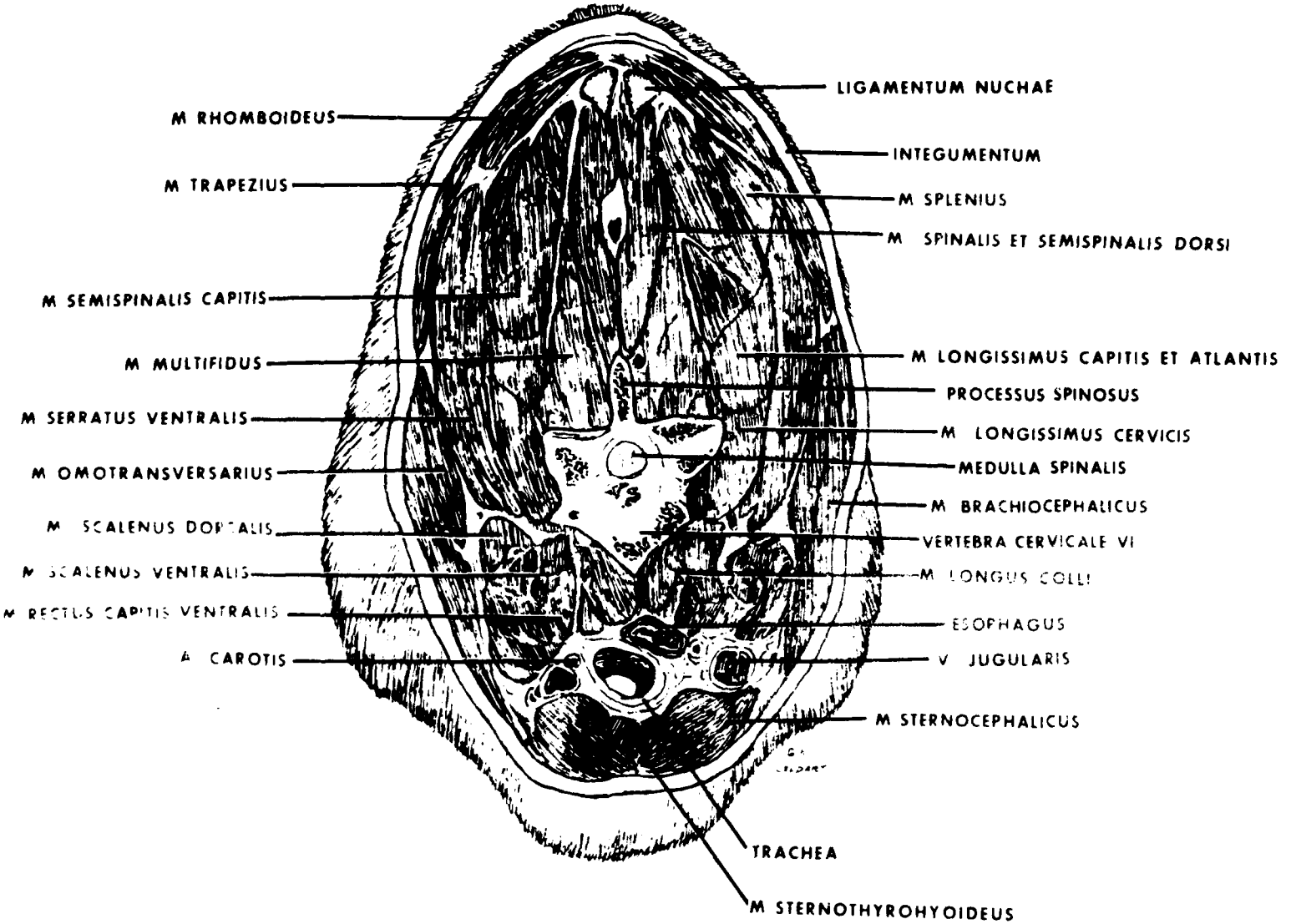

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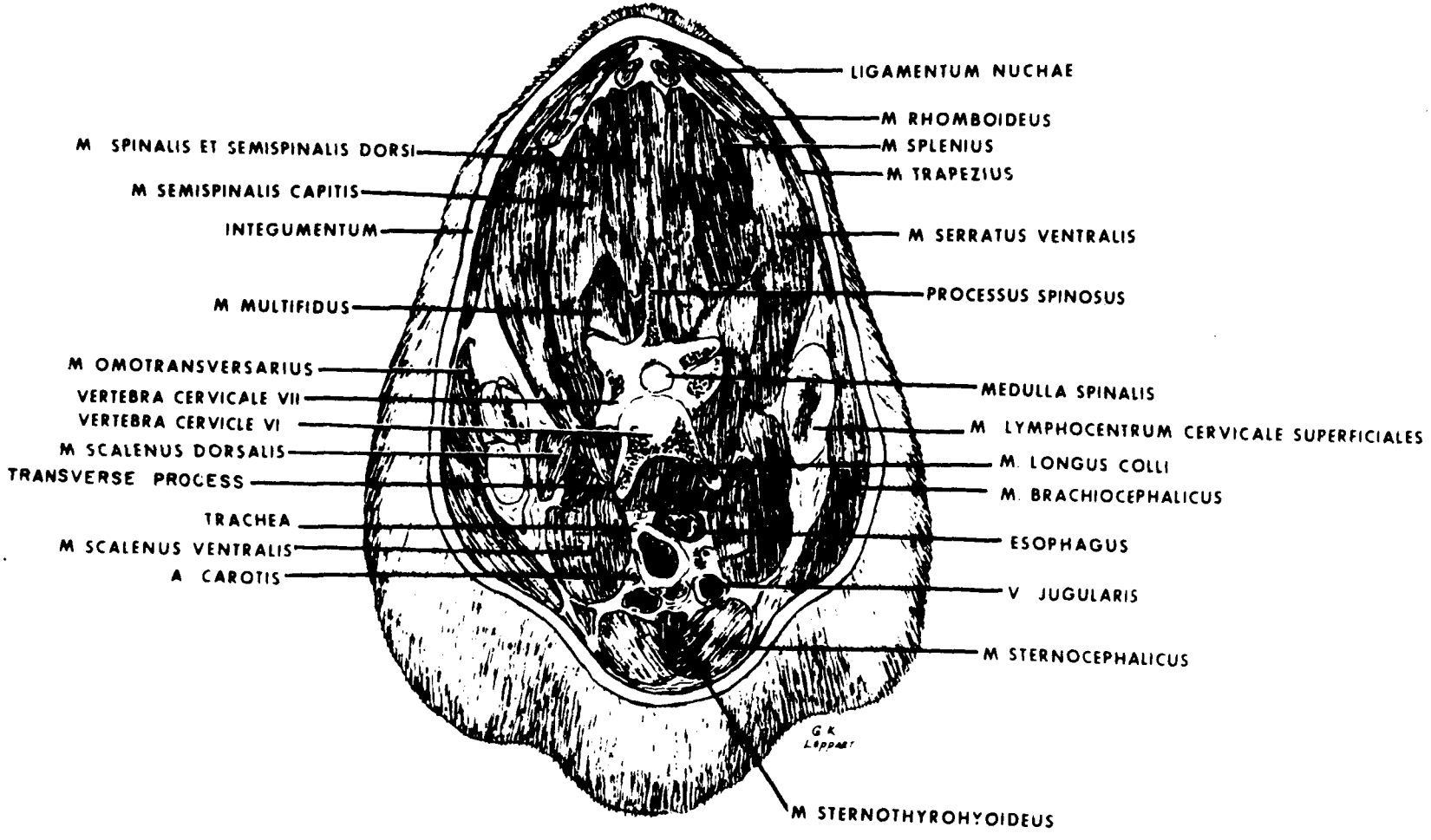

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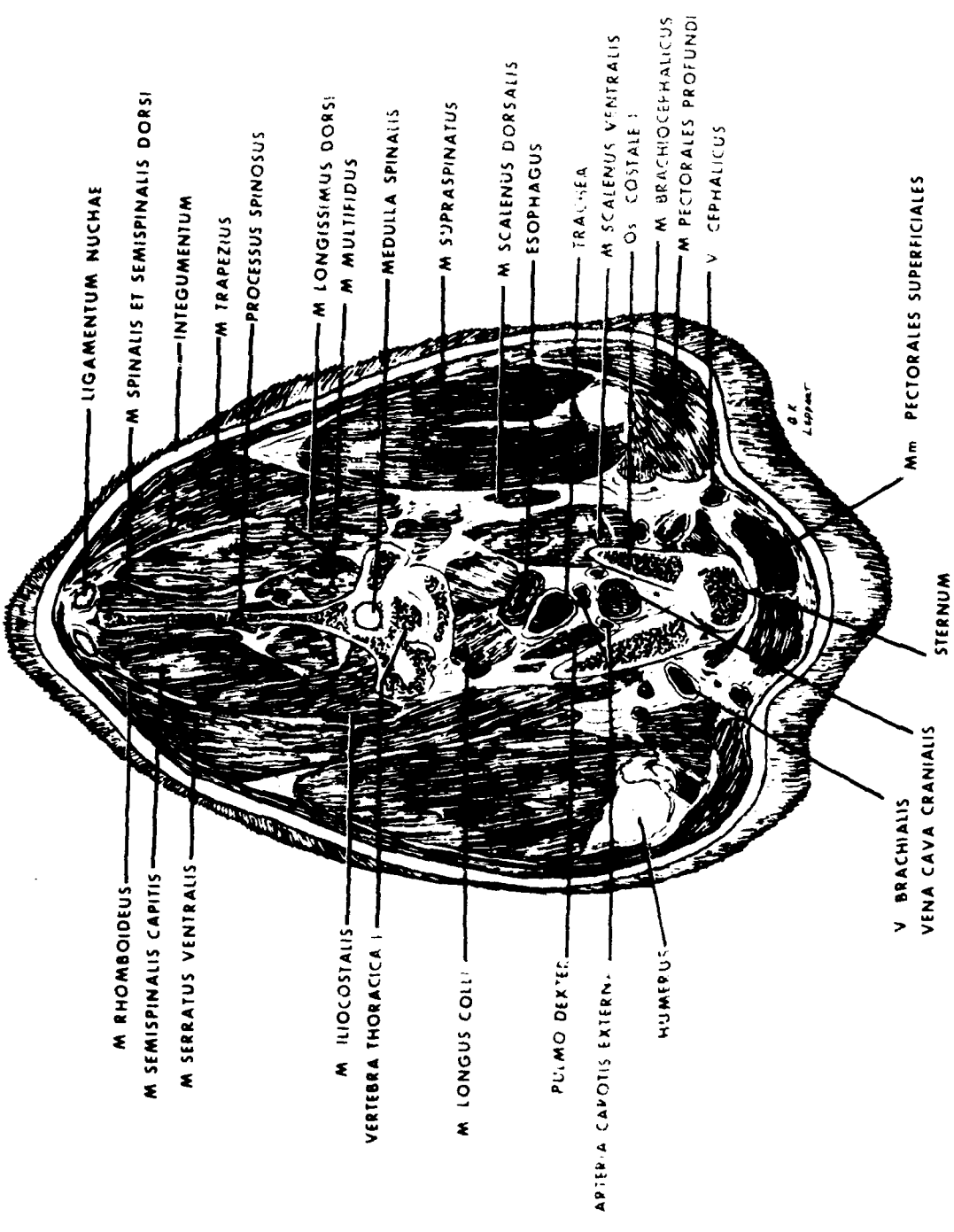
C. Thorax and Thoracic Limb (Sections 23-34).



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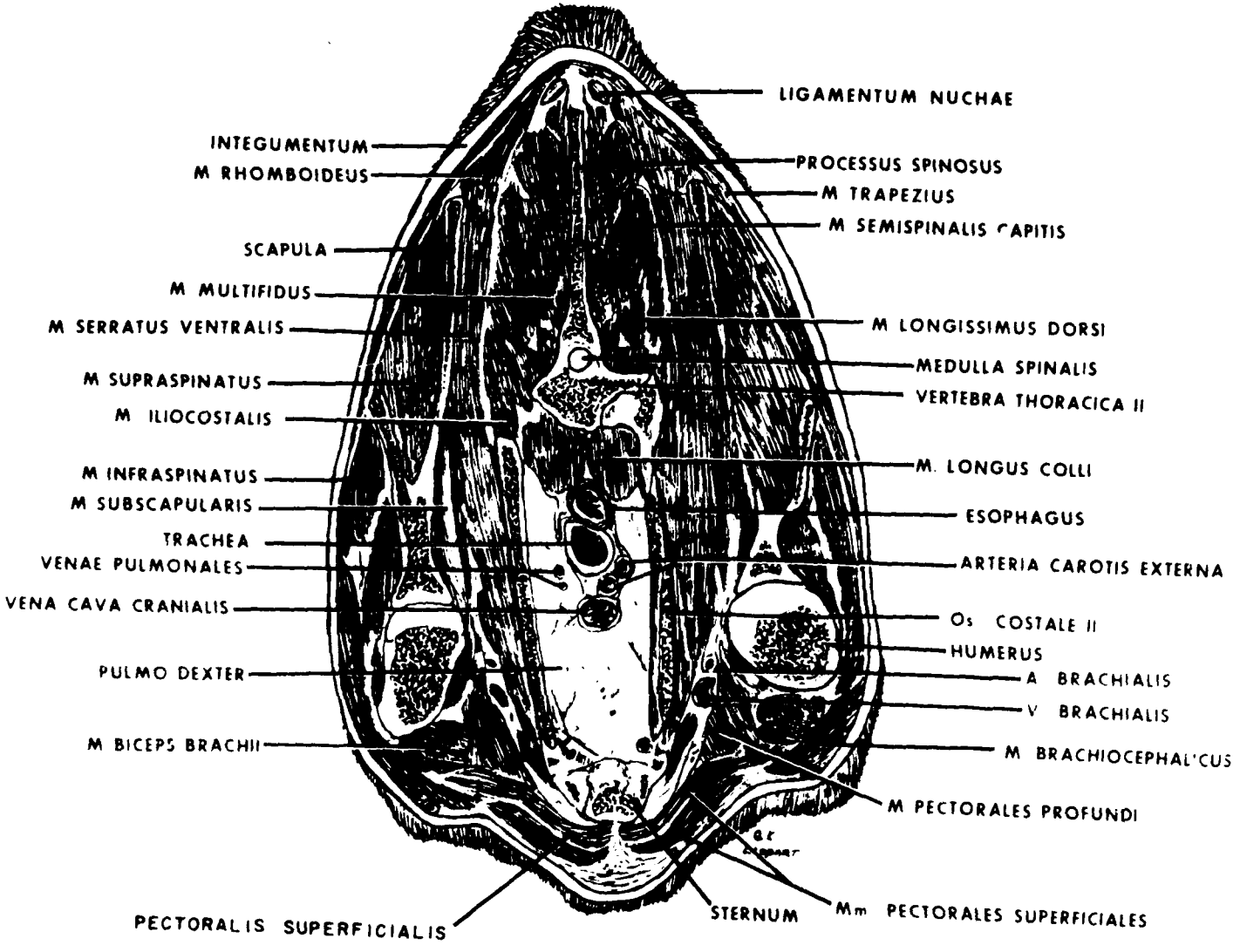

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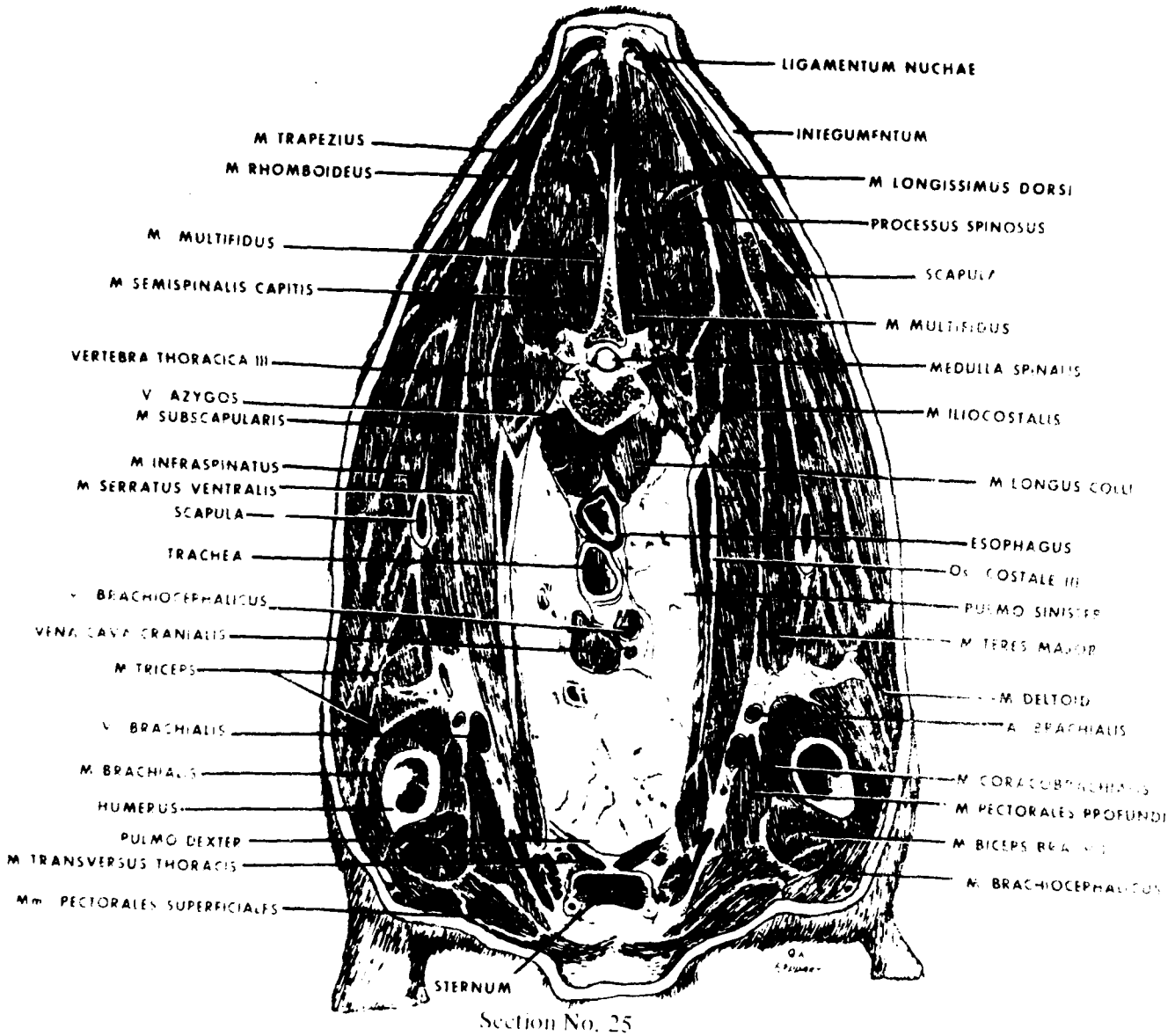

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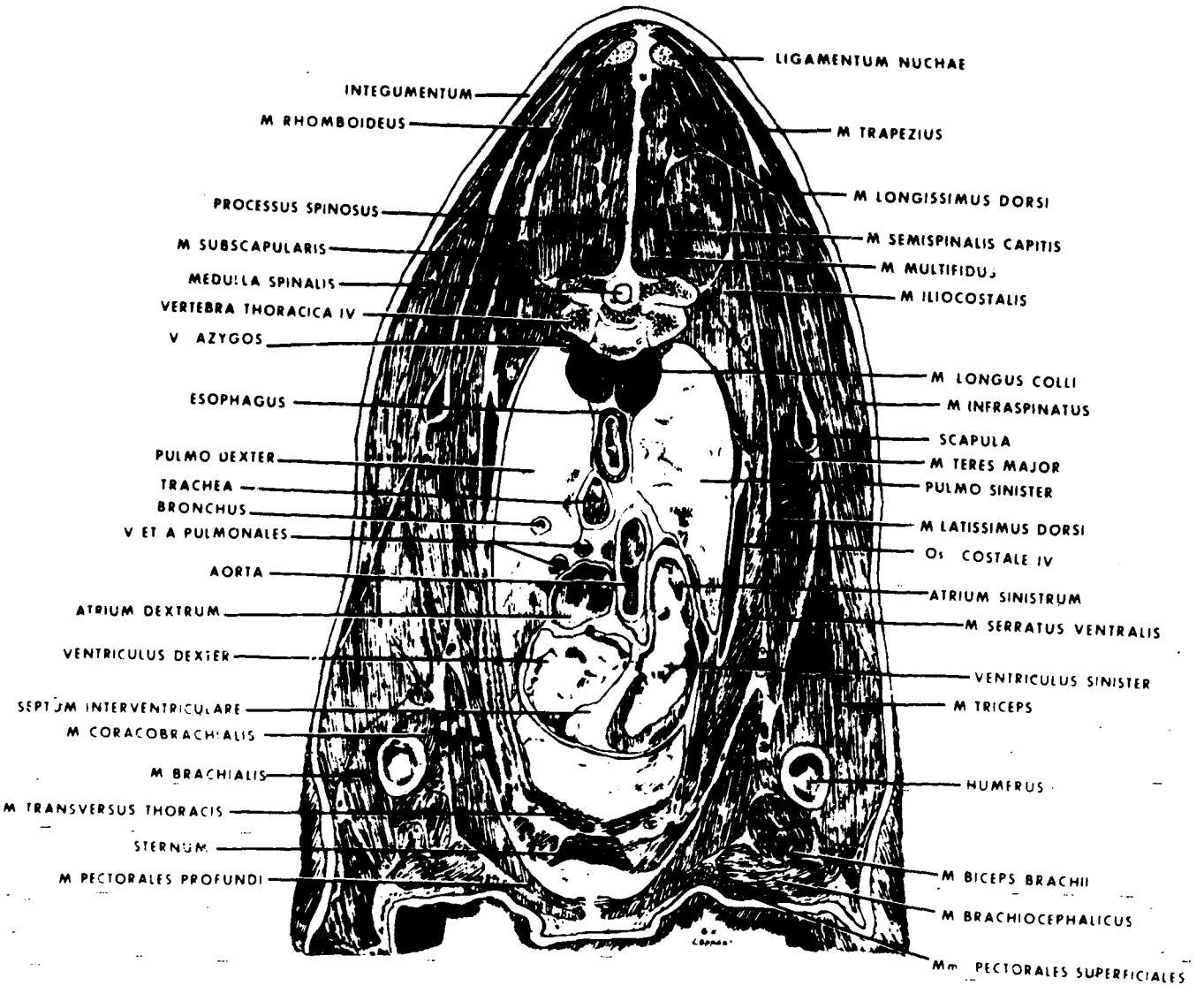

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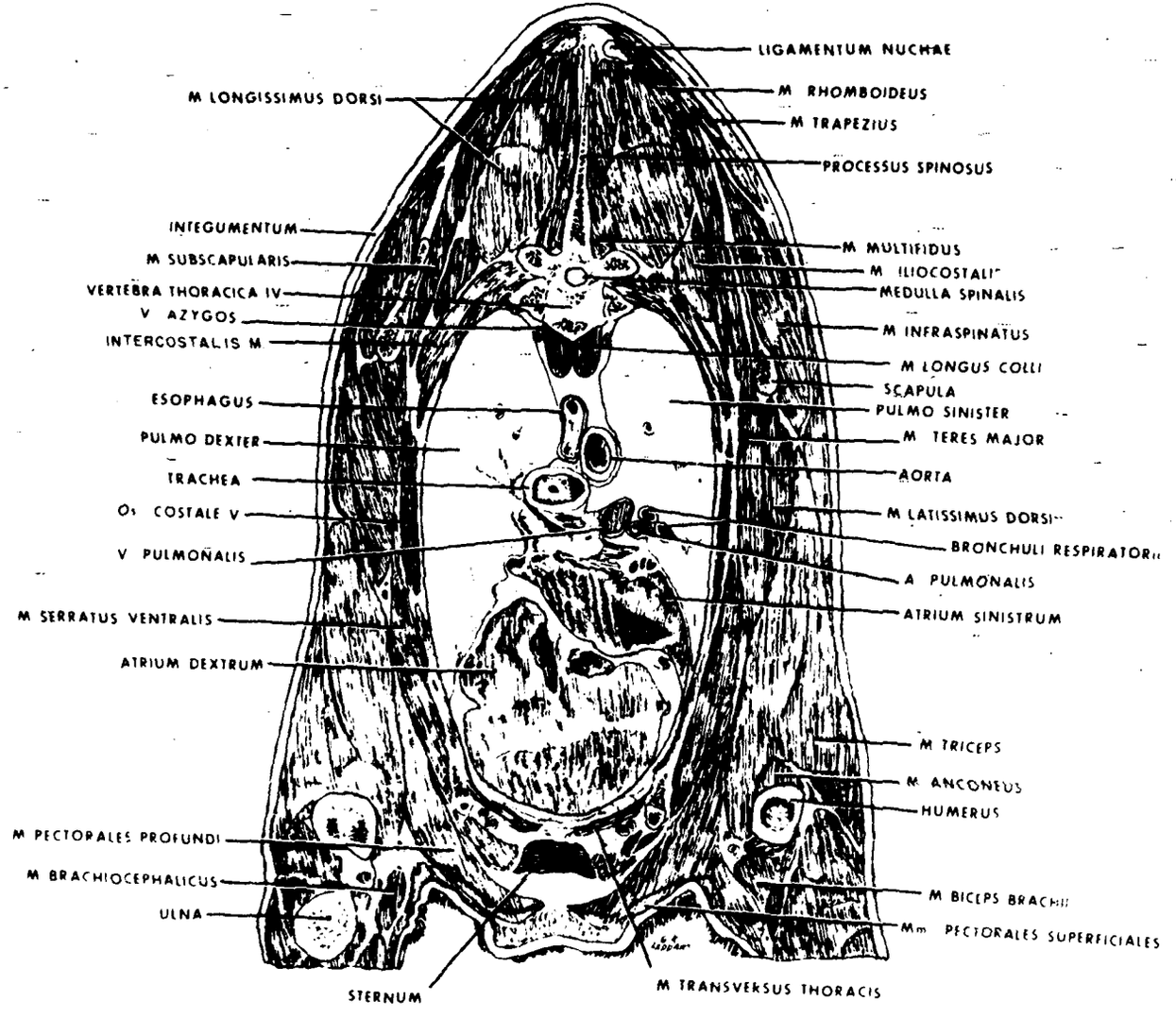

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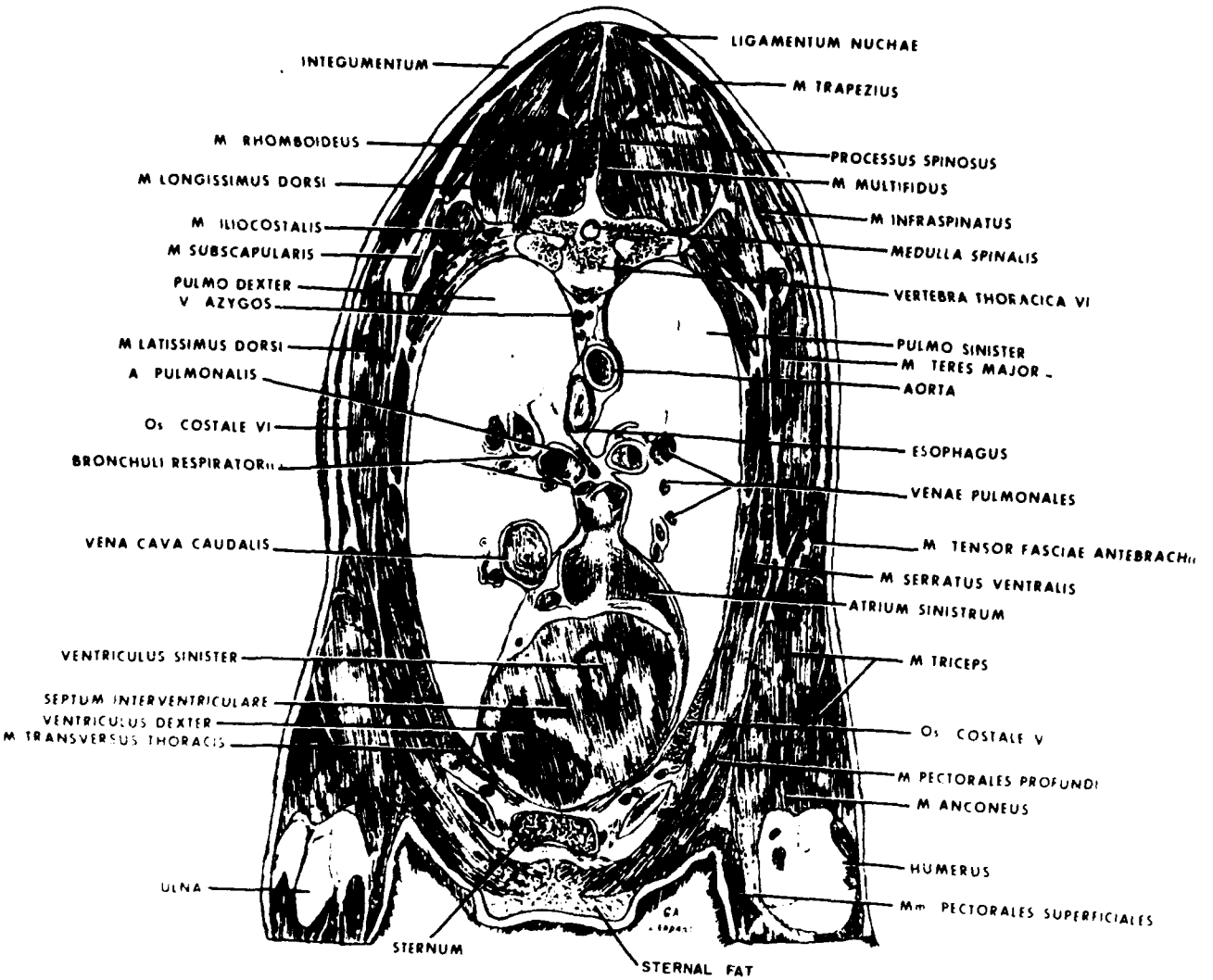

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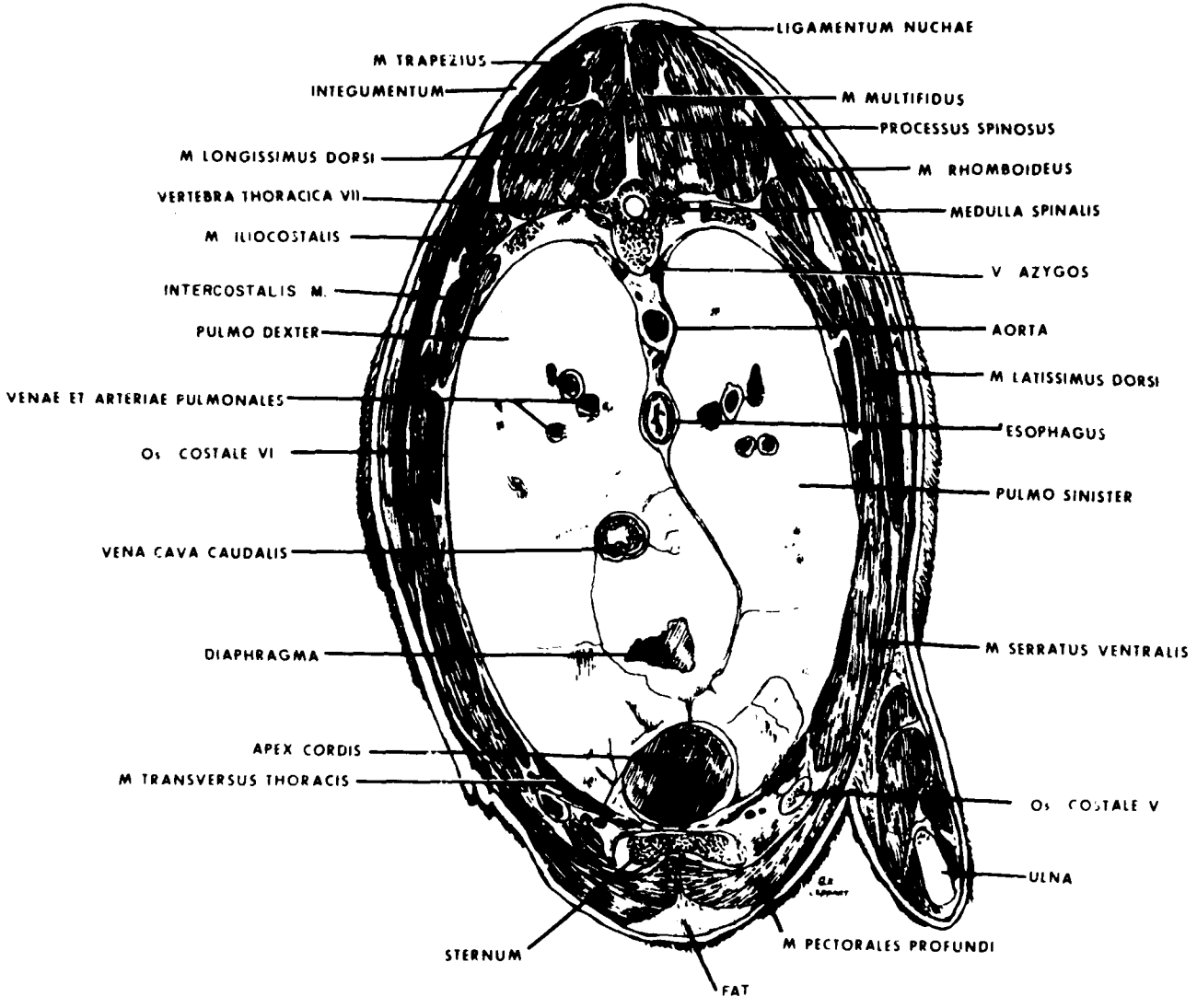
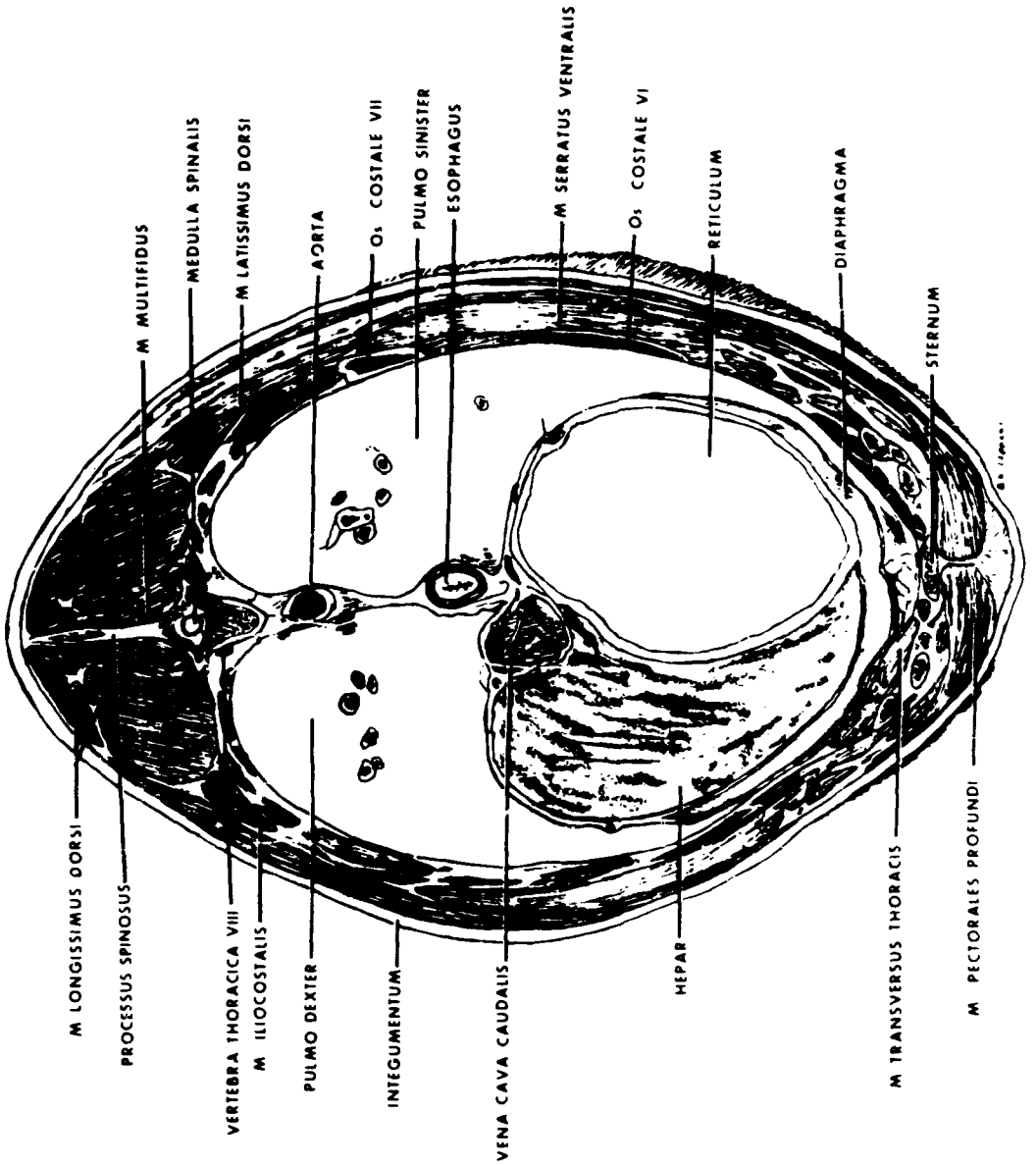
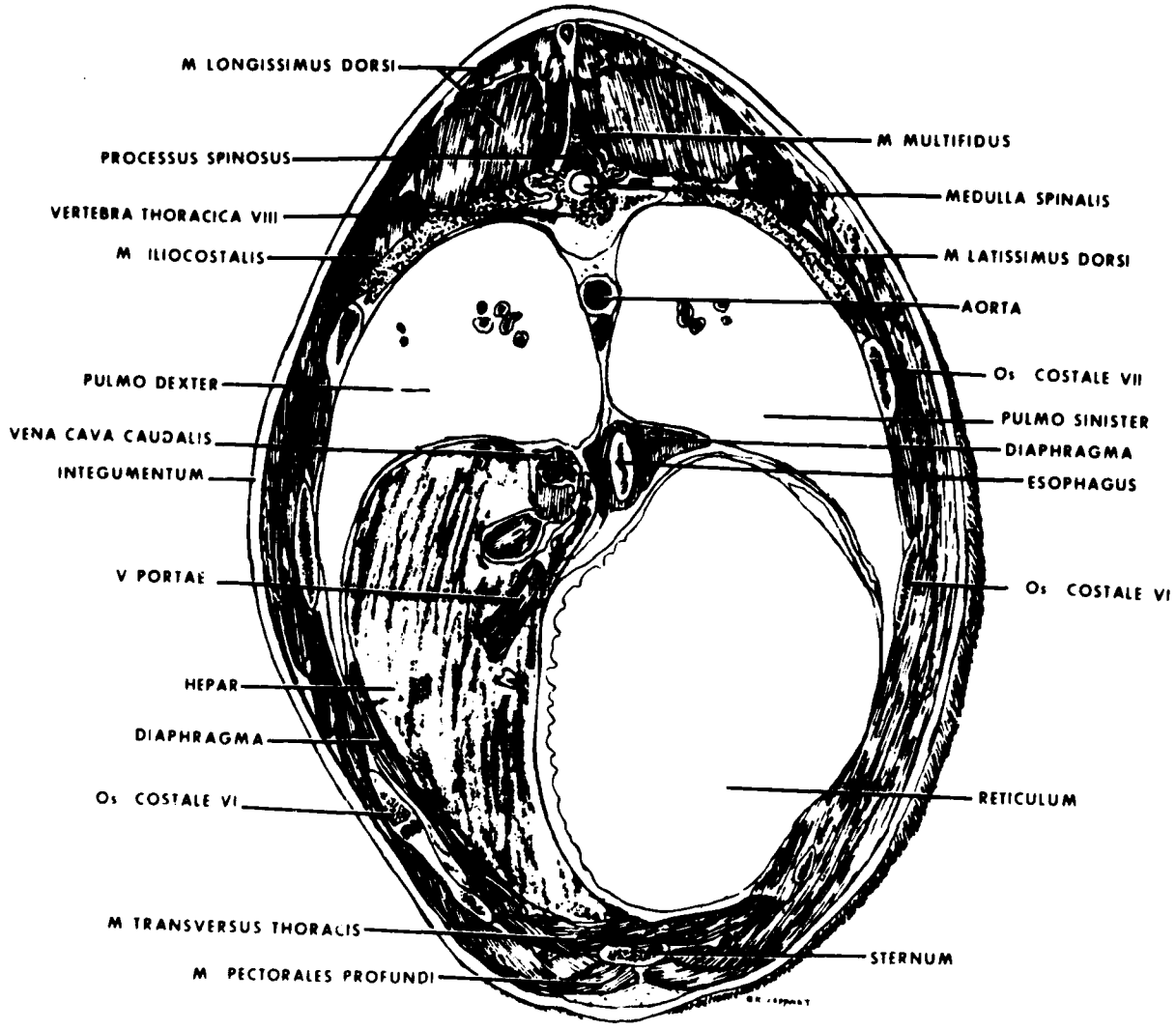


Section No. 29

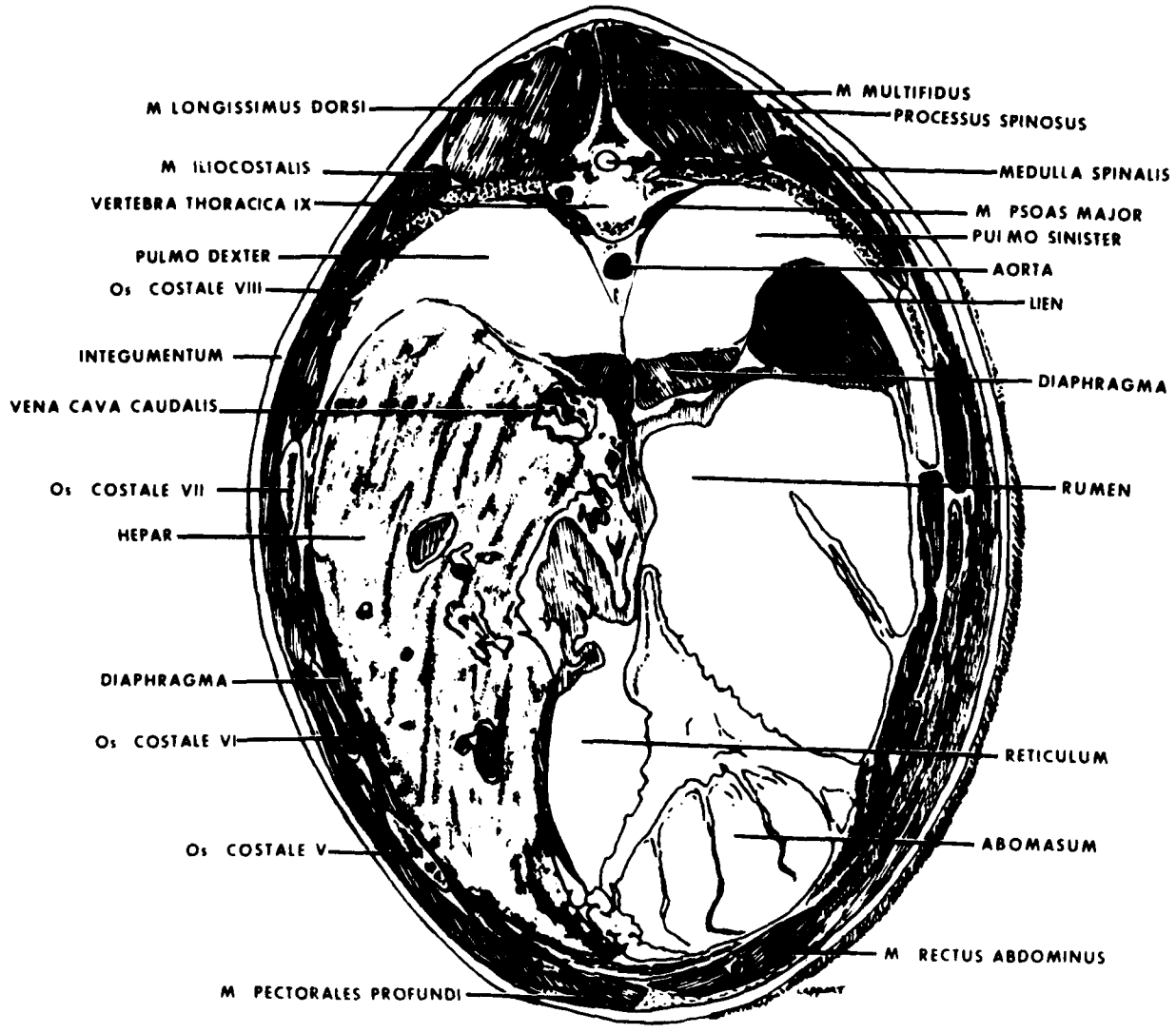
D. Abdomen (Sections 30-45).



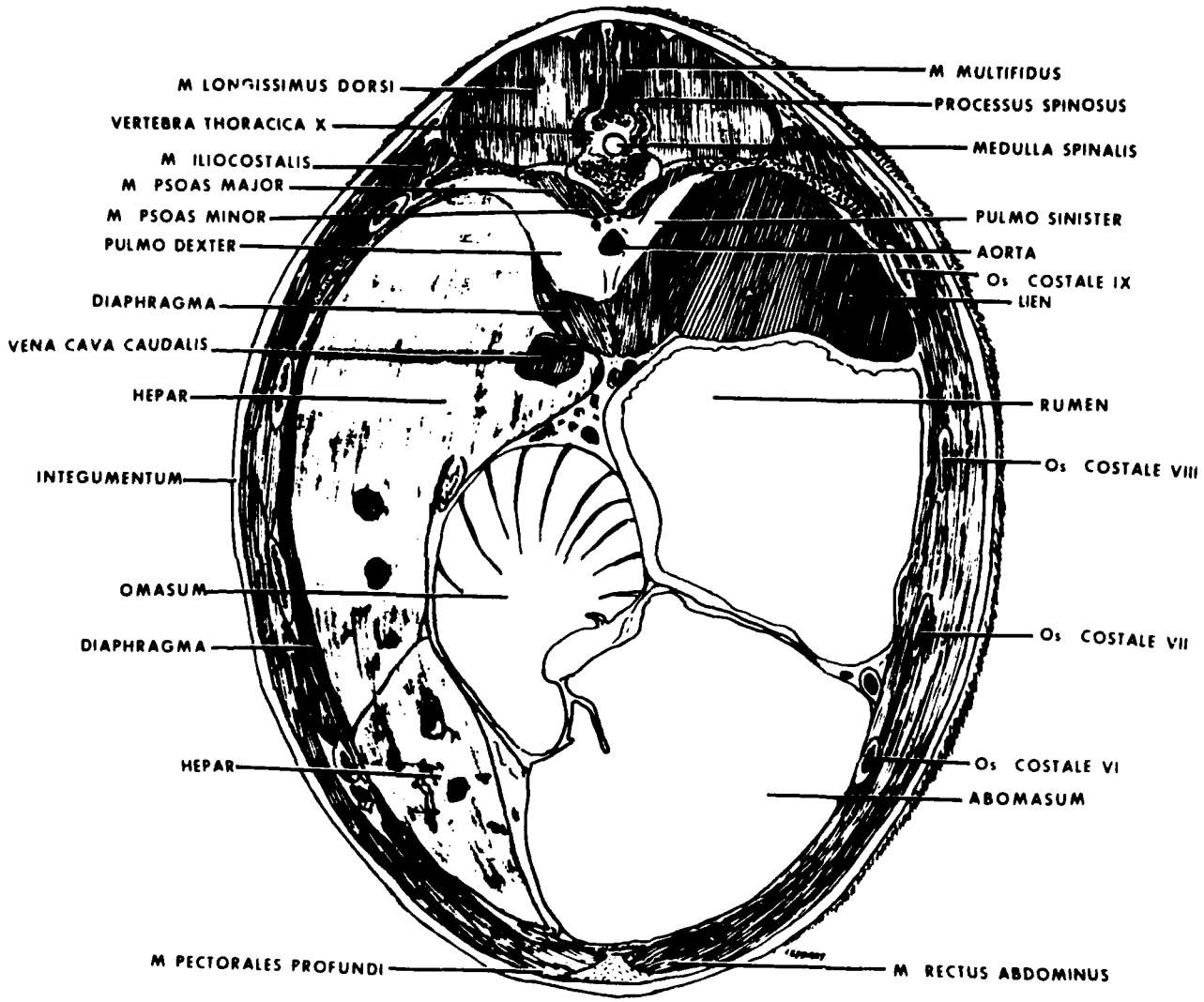
Section No. 30



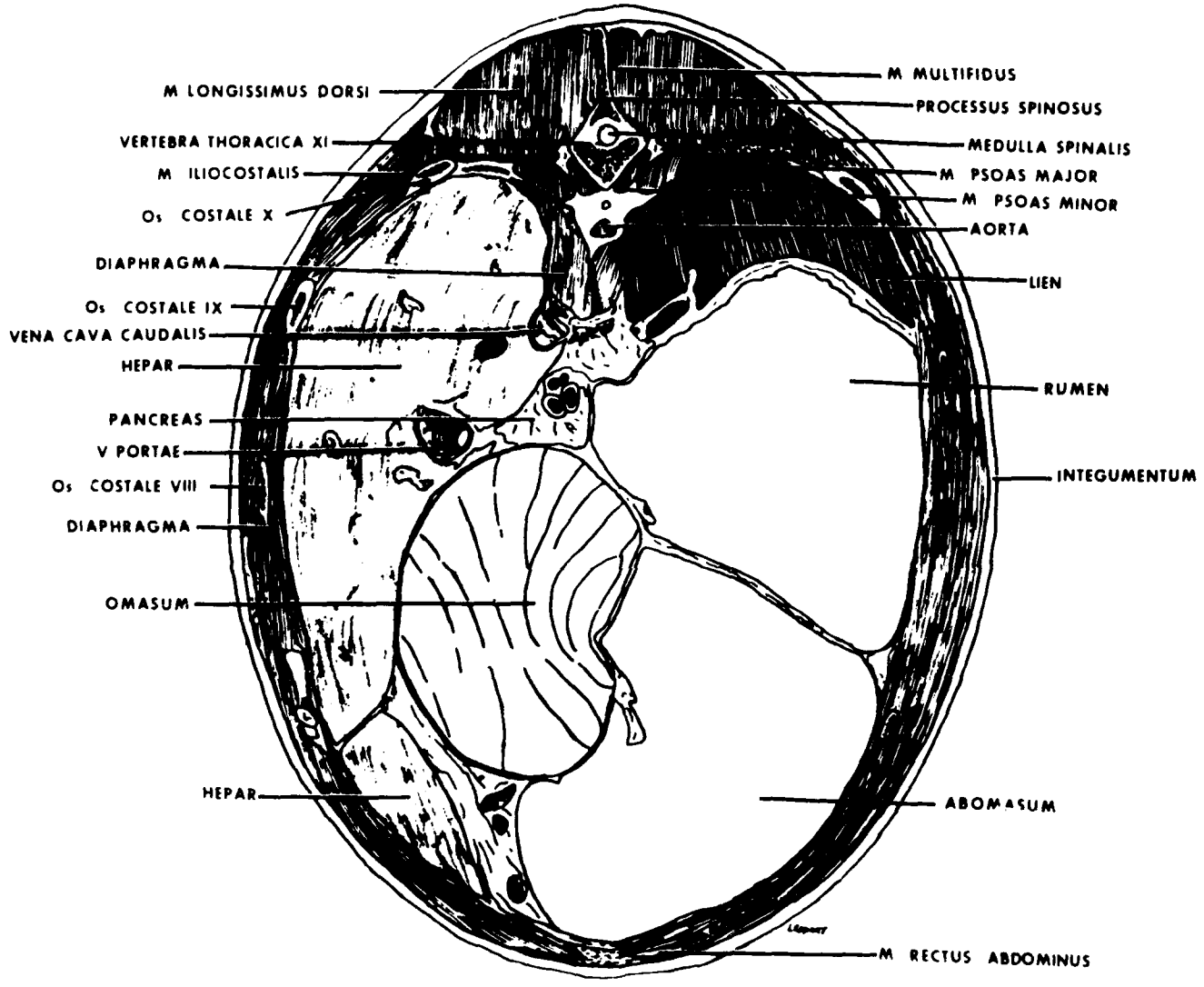
Section No. 31



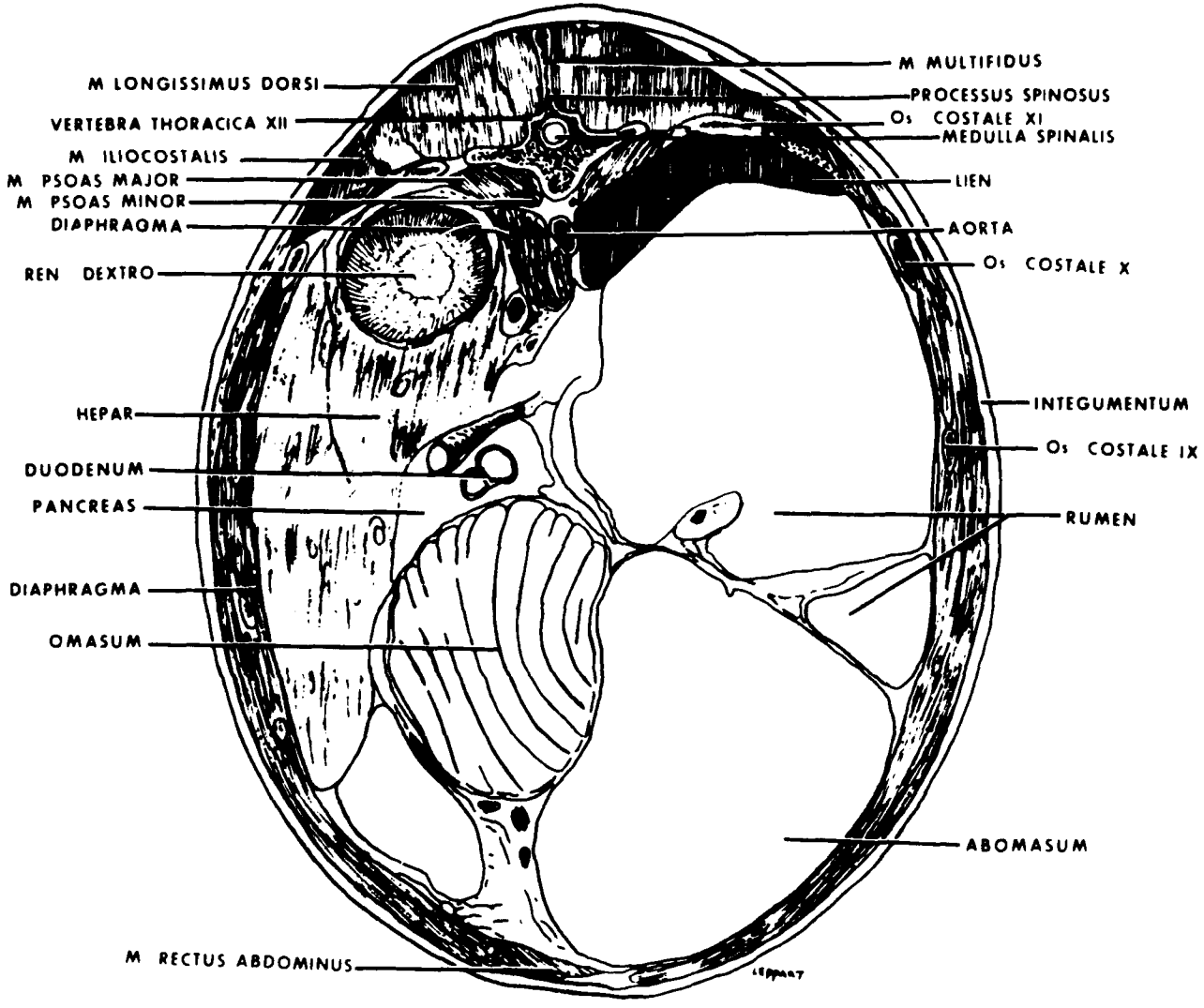
Section No. 32



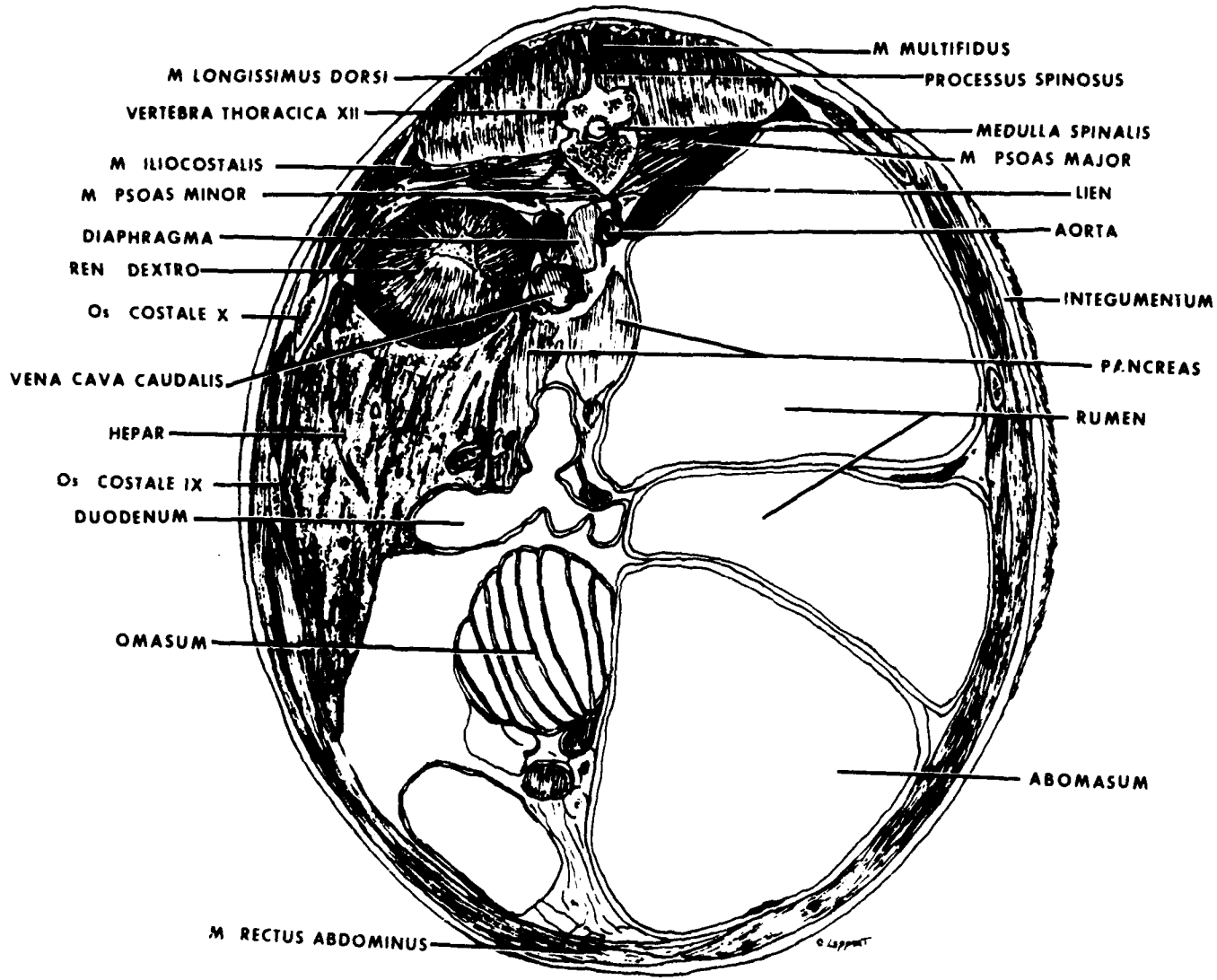
Section No. 33



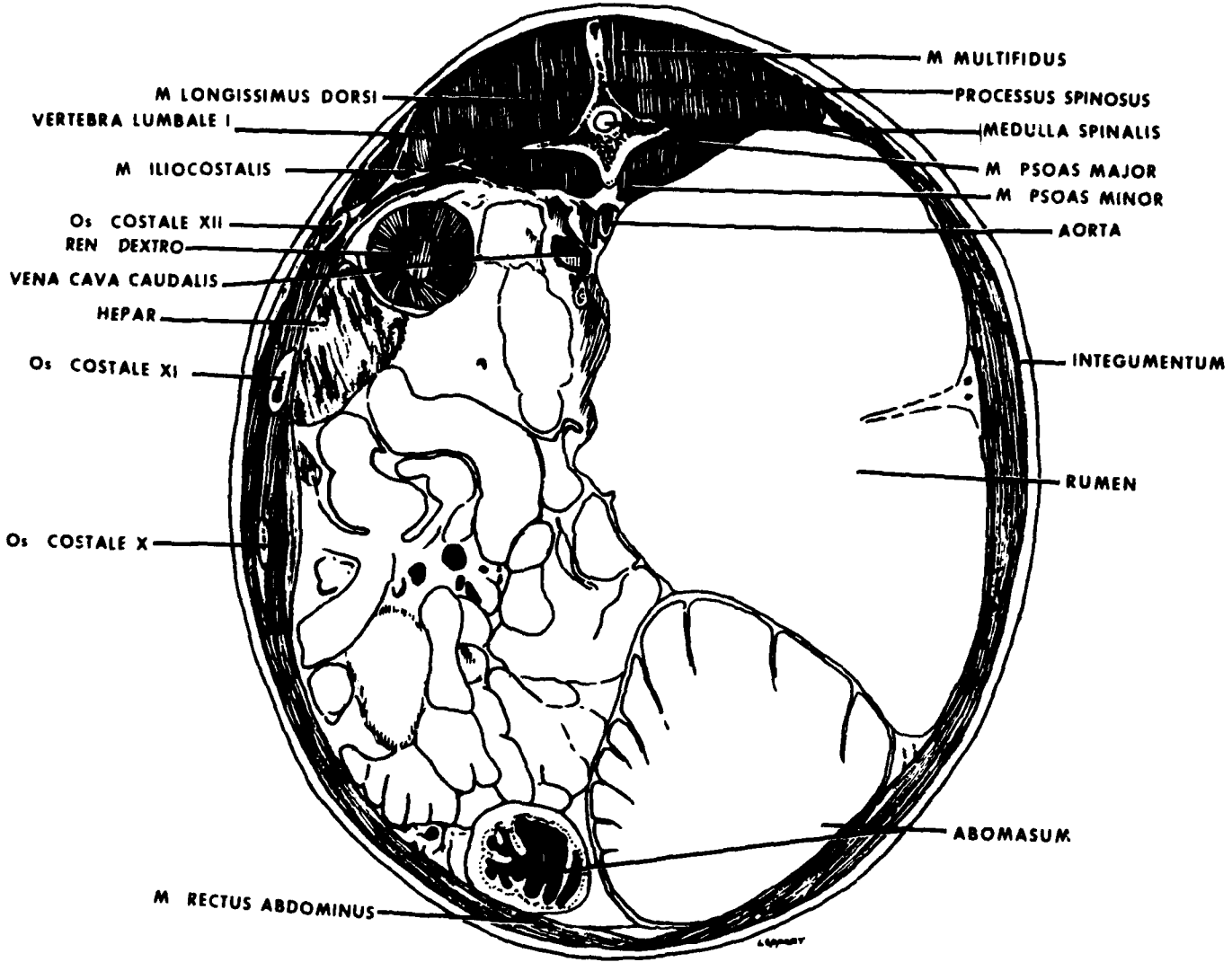
Section No. 34



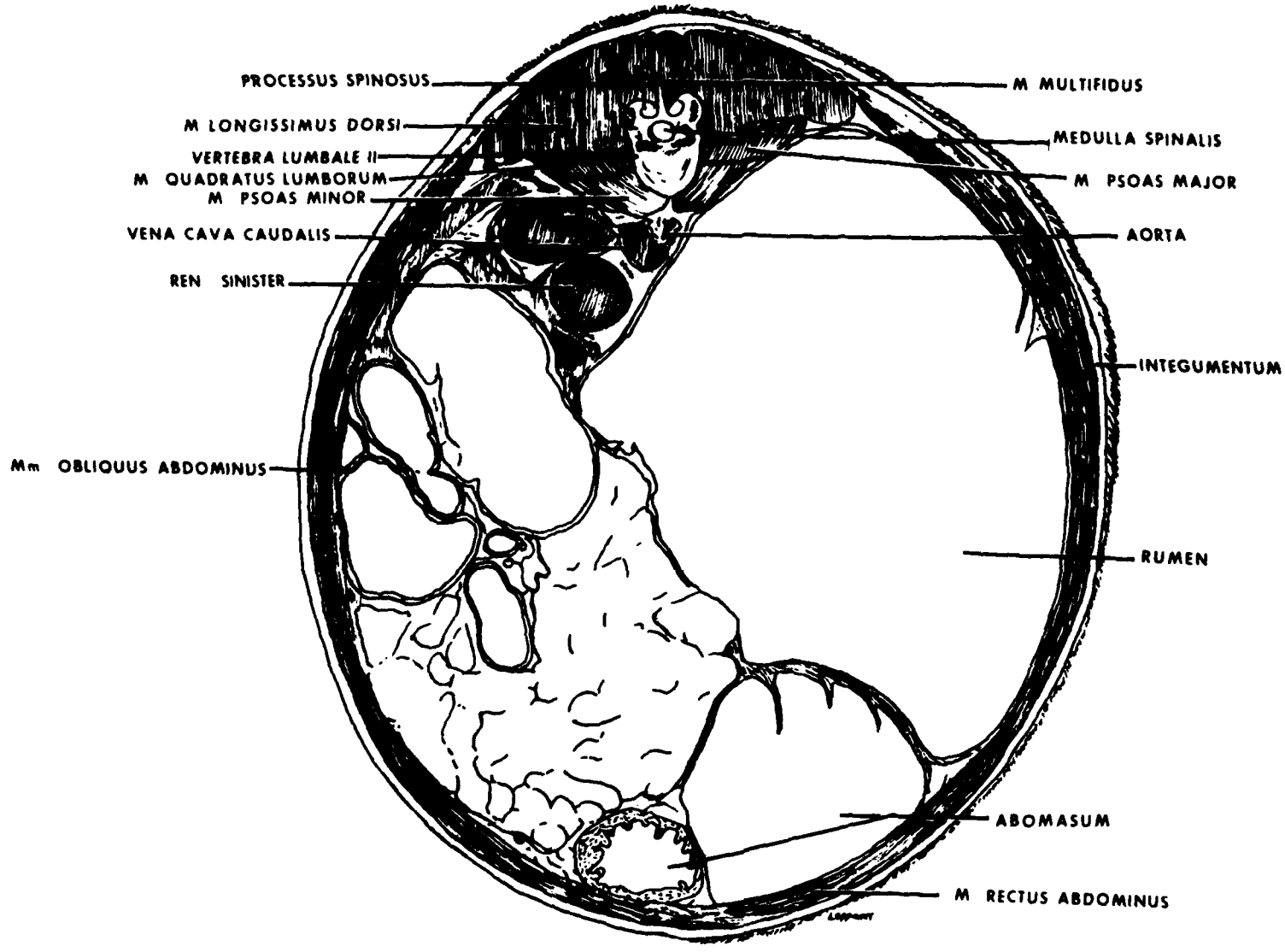
Section No. 35



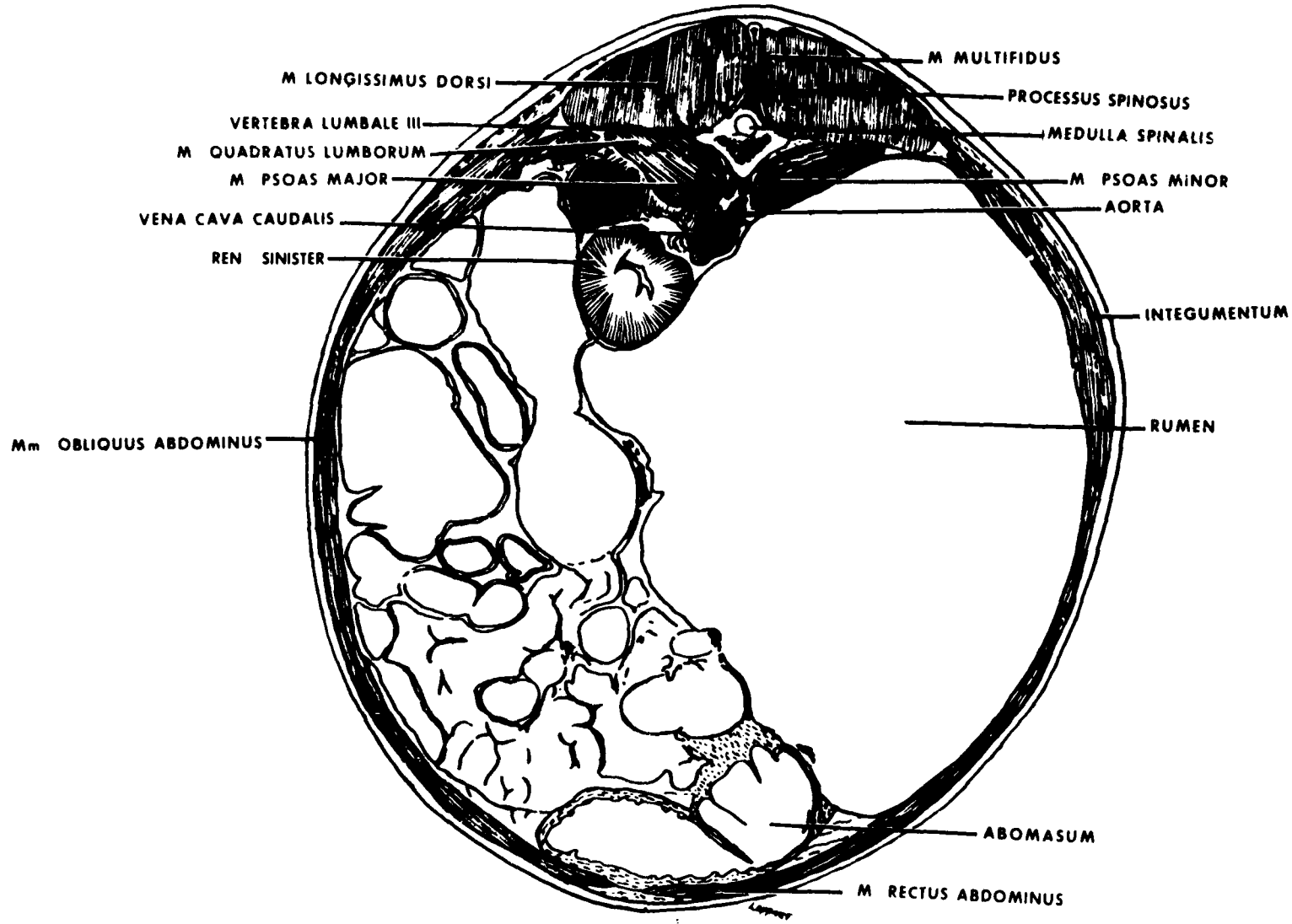
Section No. 36



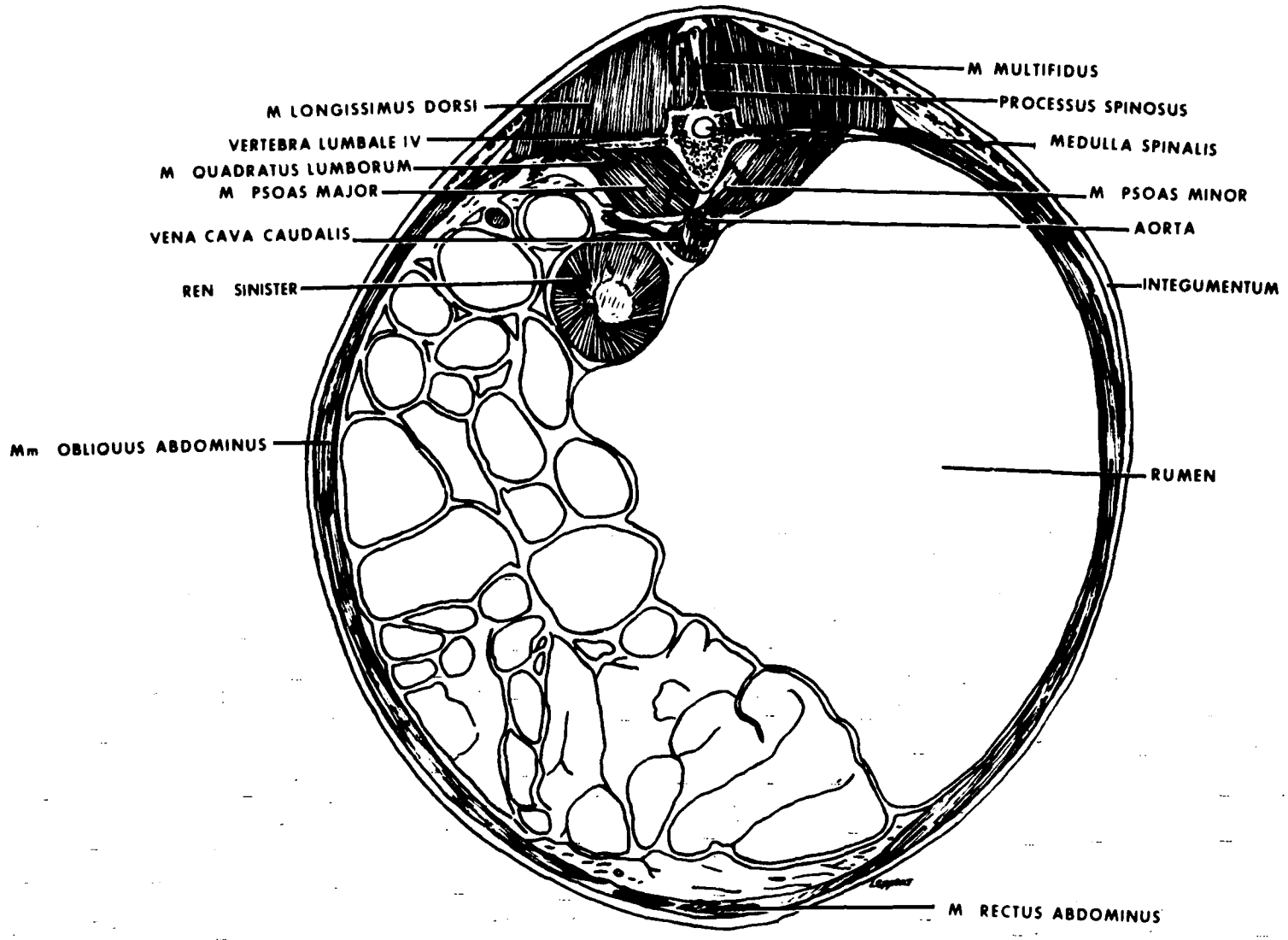
Section No. 37



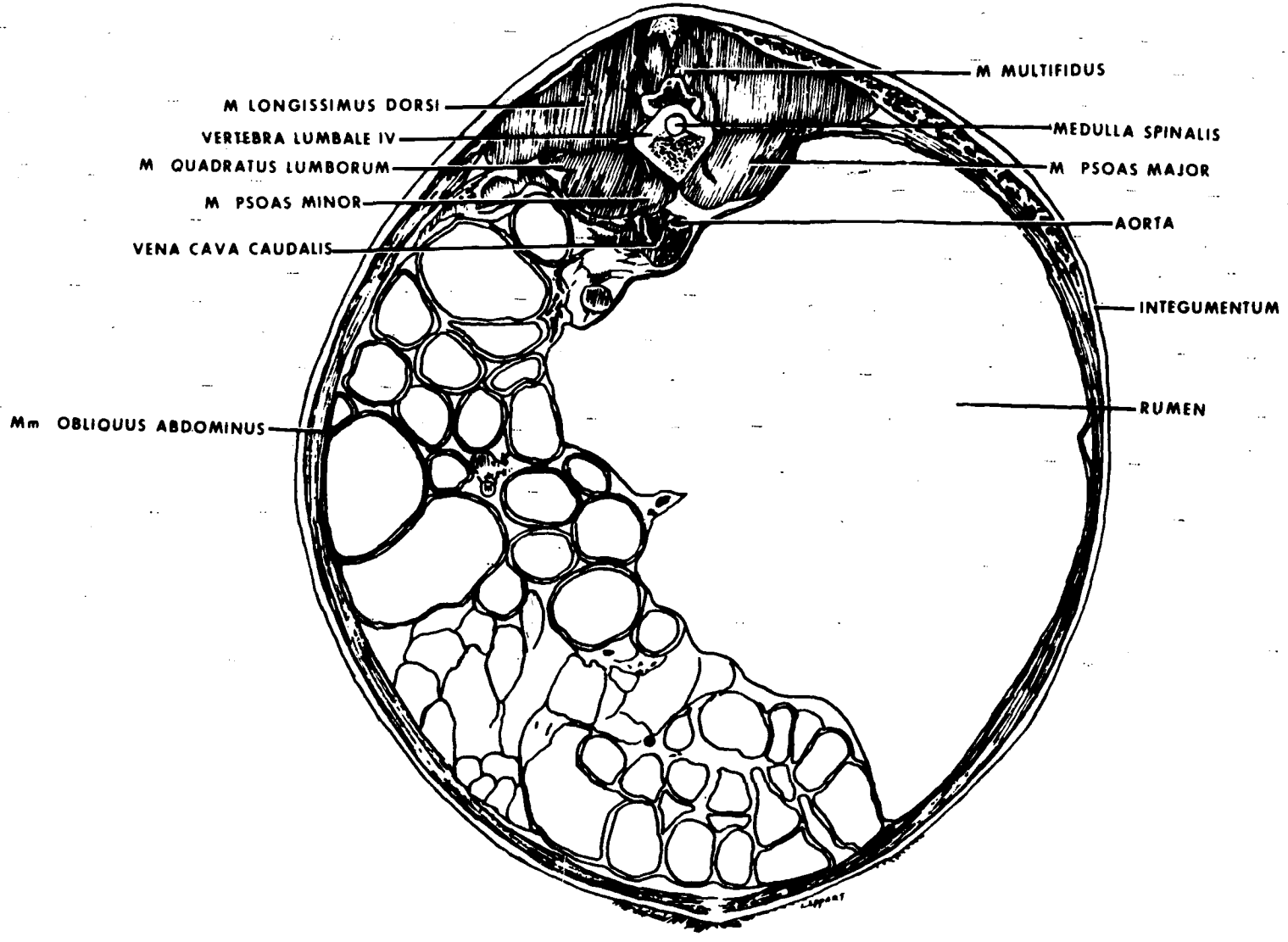
Section No. 38



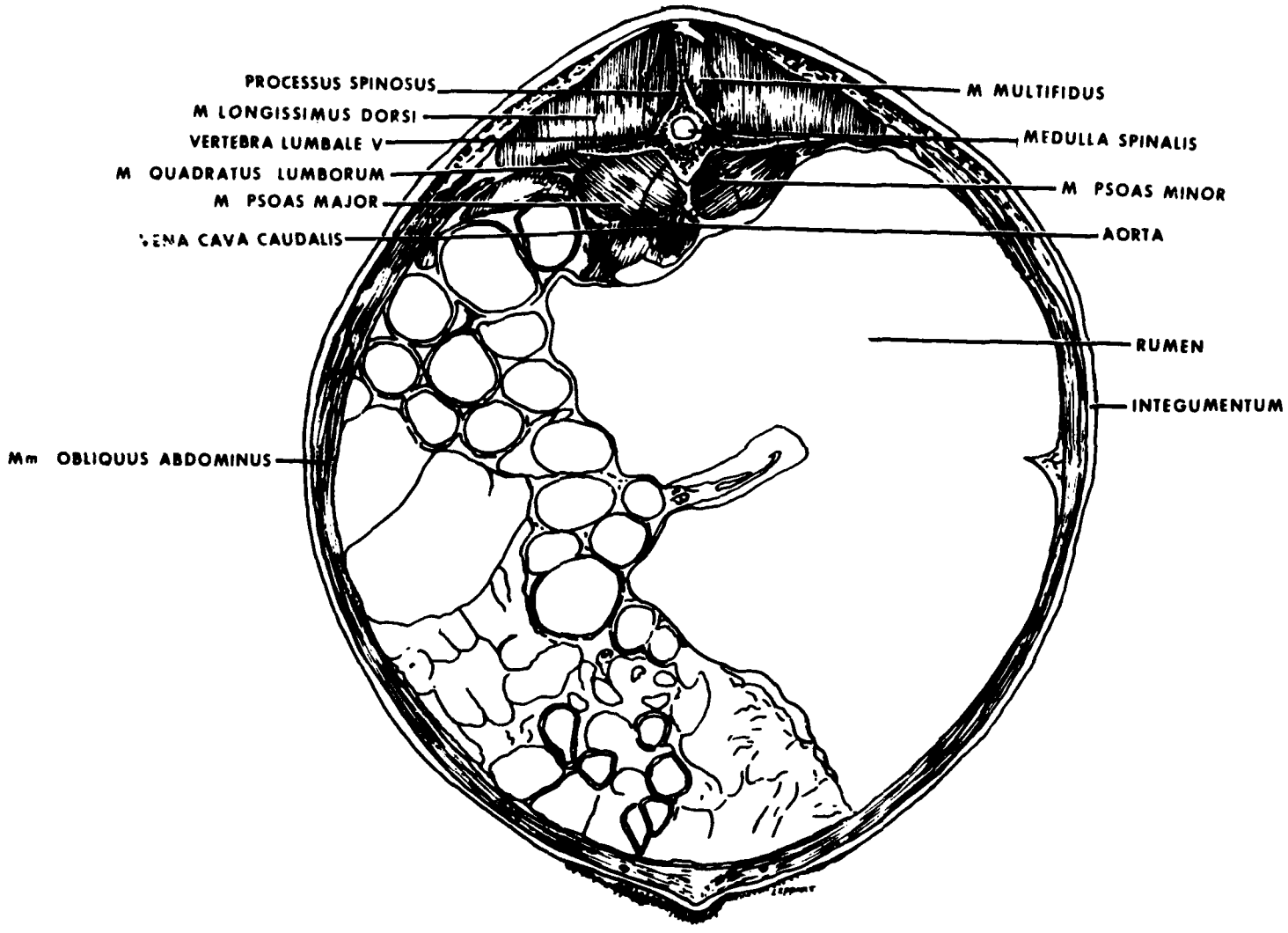
Section No. 39



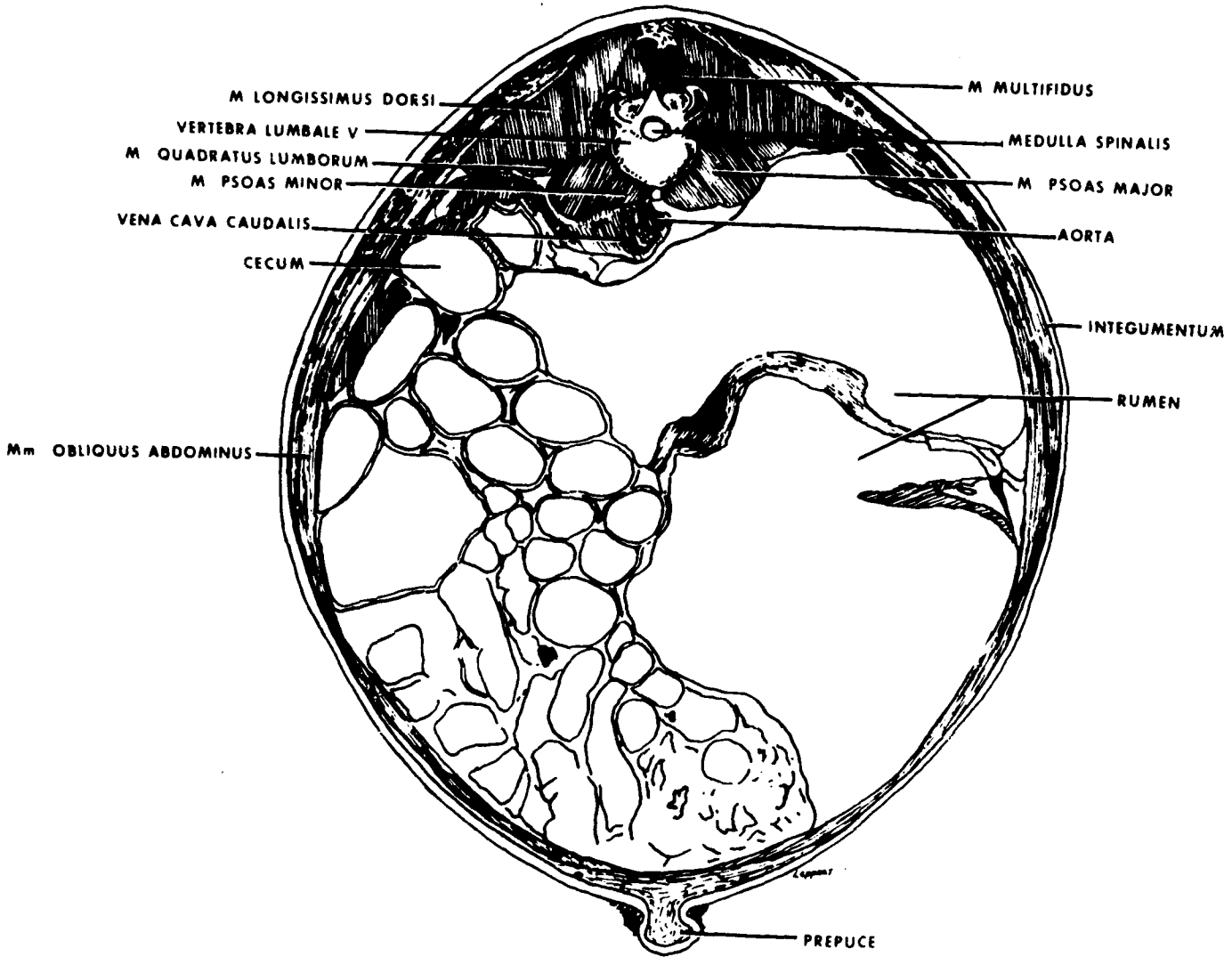
Section No. 40



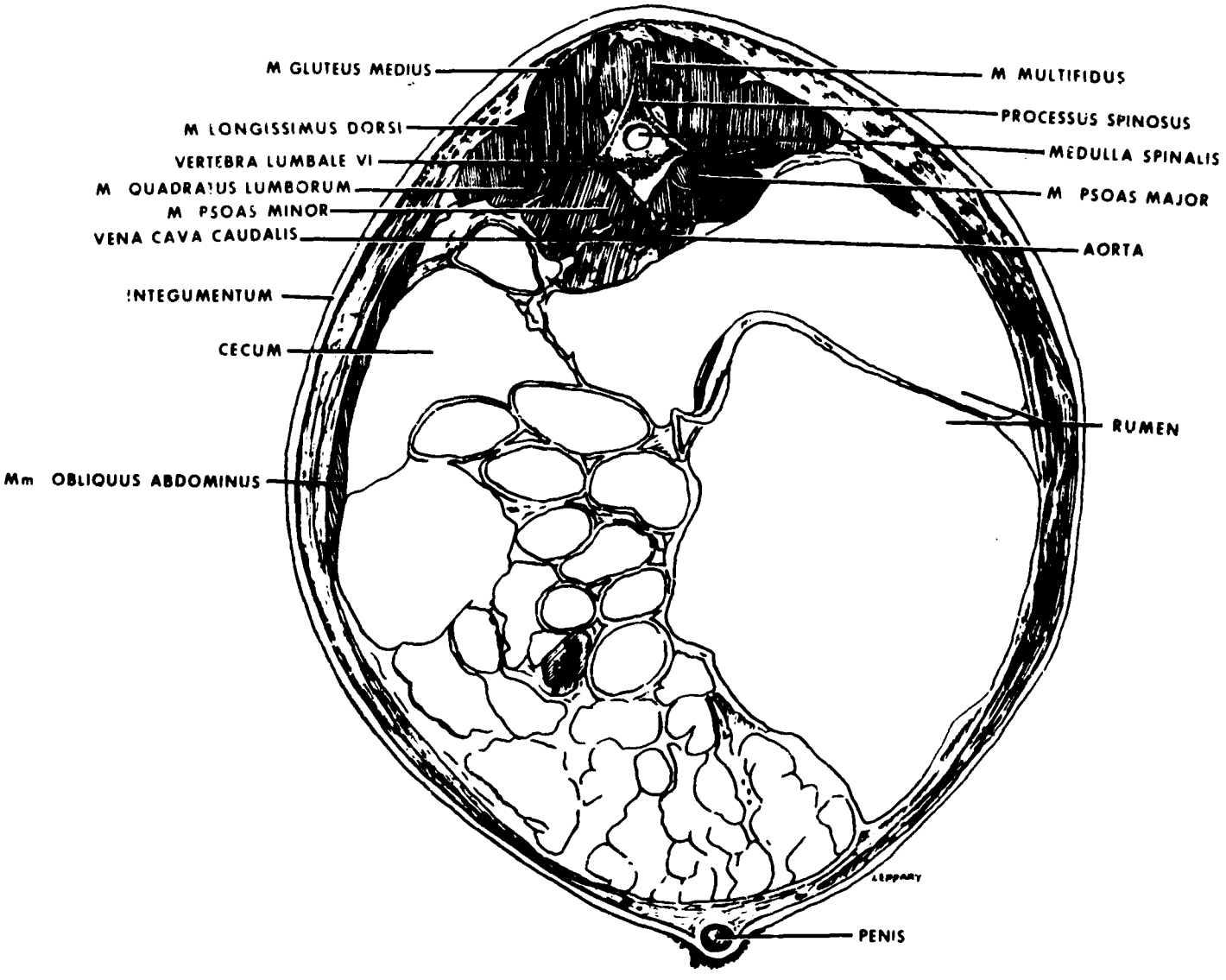
Section No. 41



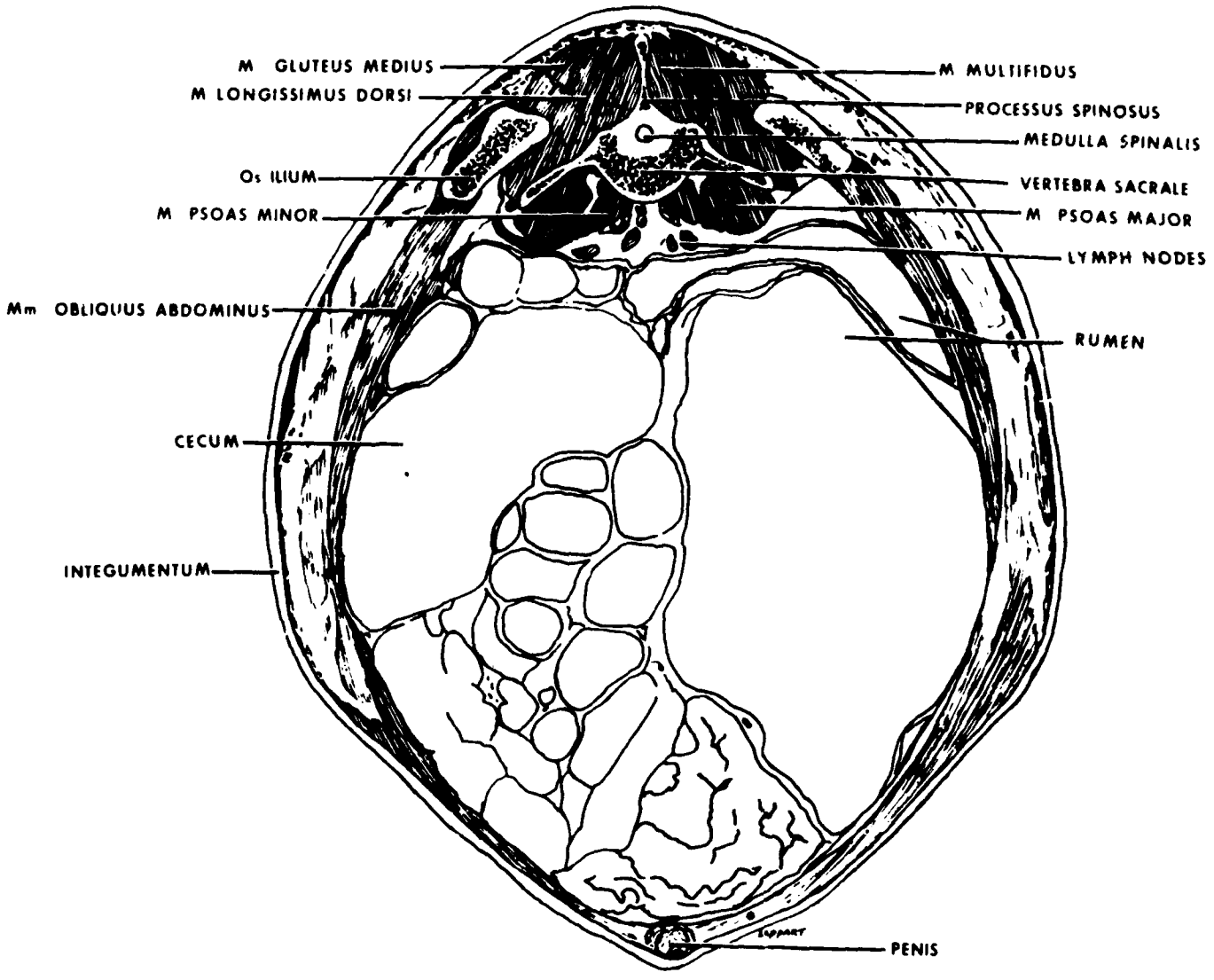
Section No. 42



Section No. 43

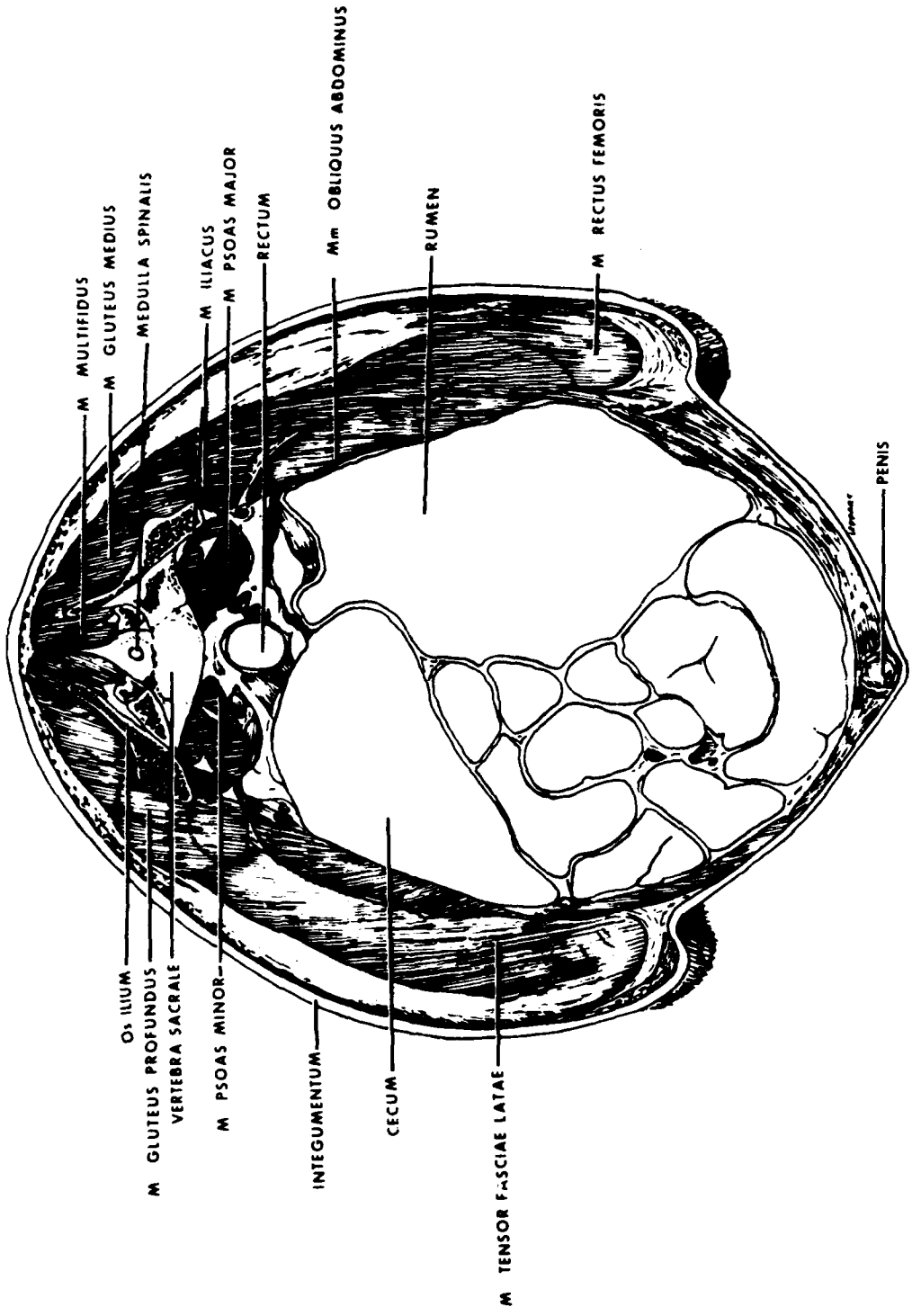


Section No. 44

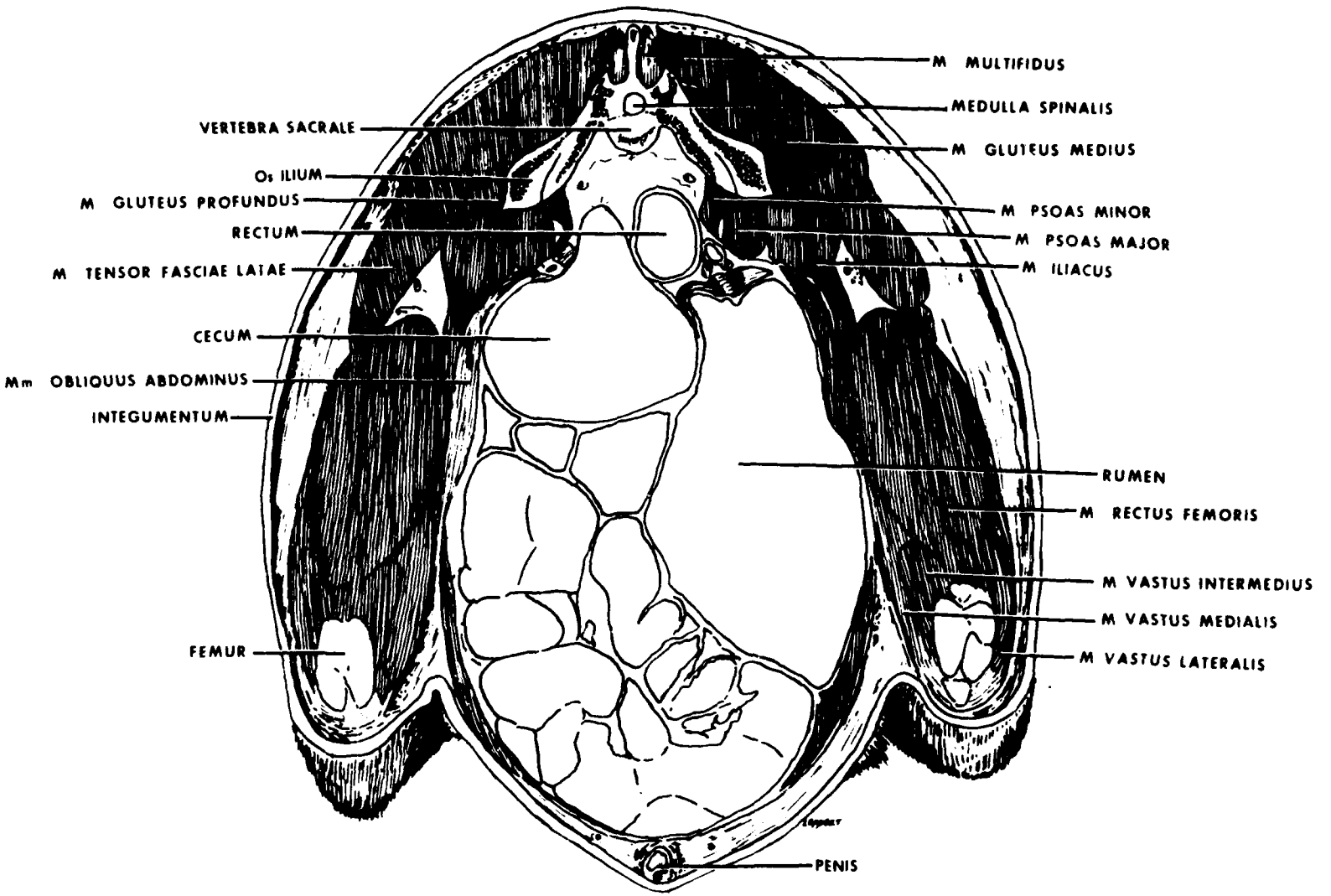


Section No. 45

E. Pelvis and Pelvic Limb (Sections 46-54).



Section No. 46



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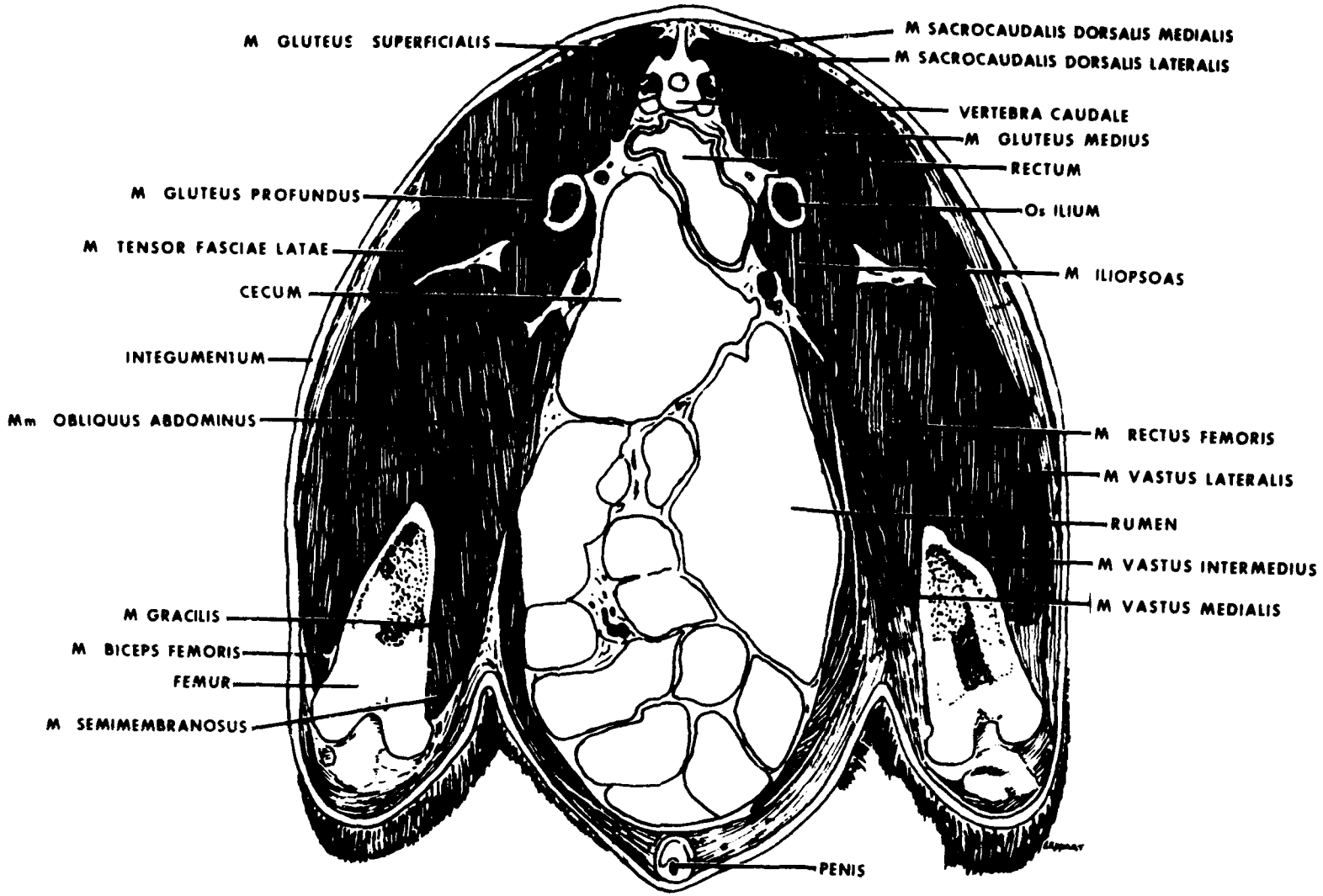
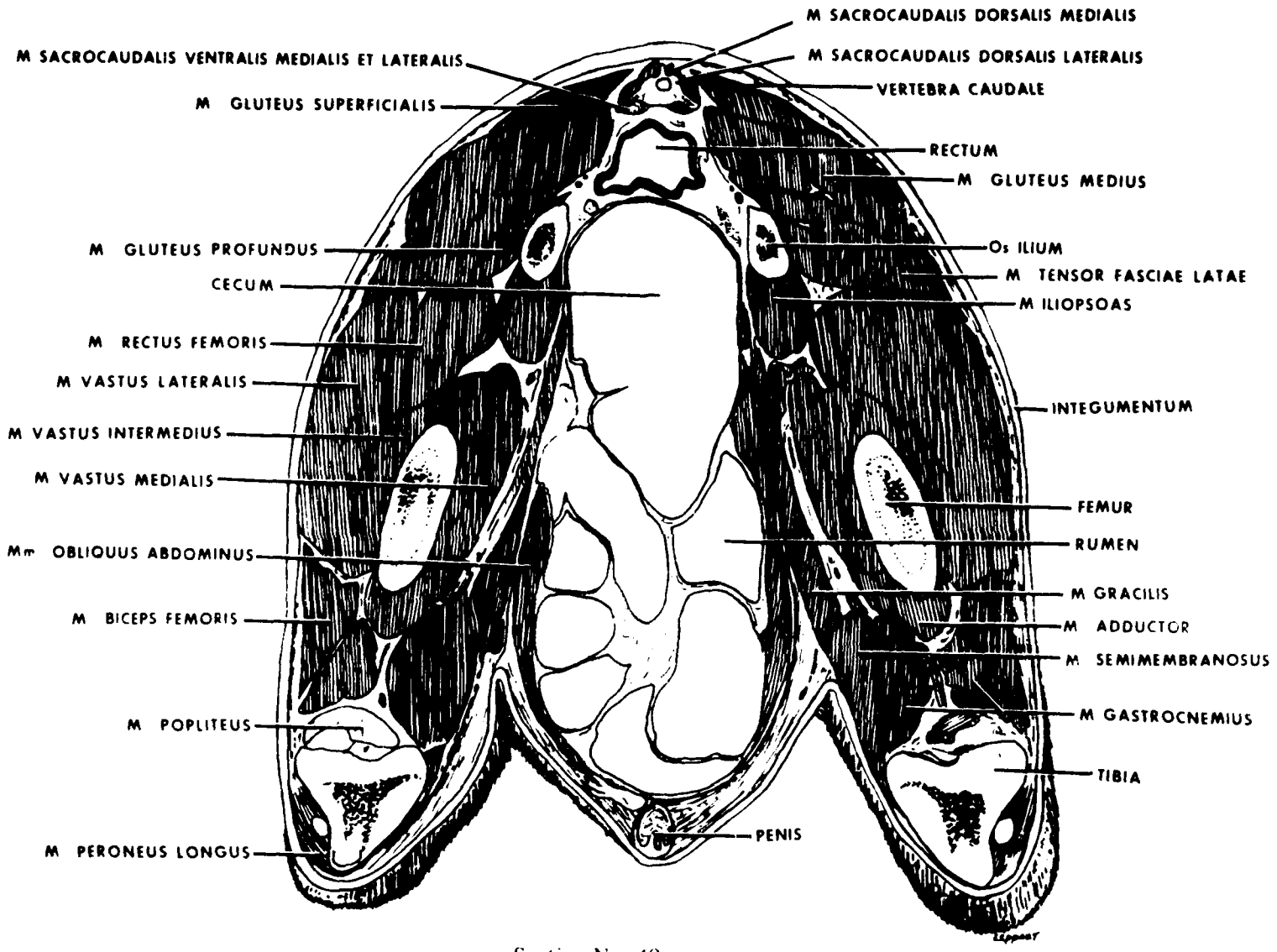
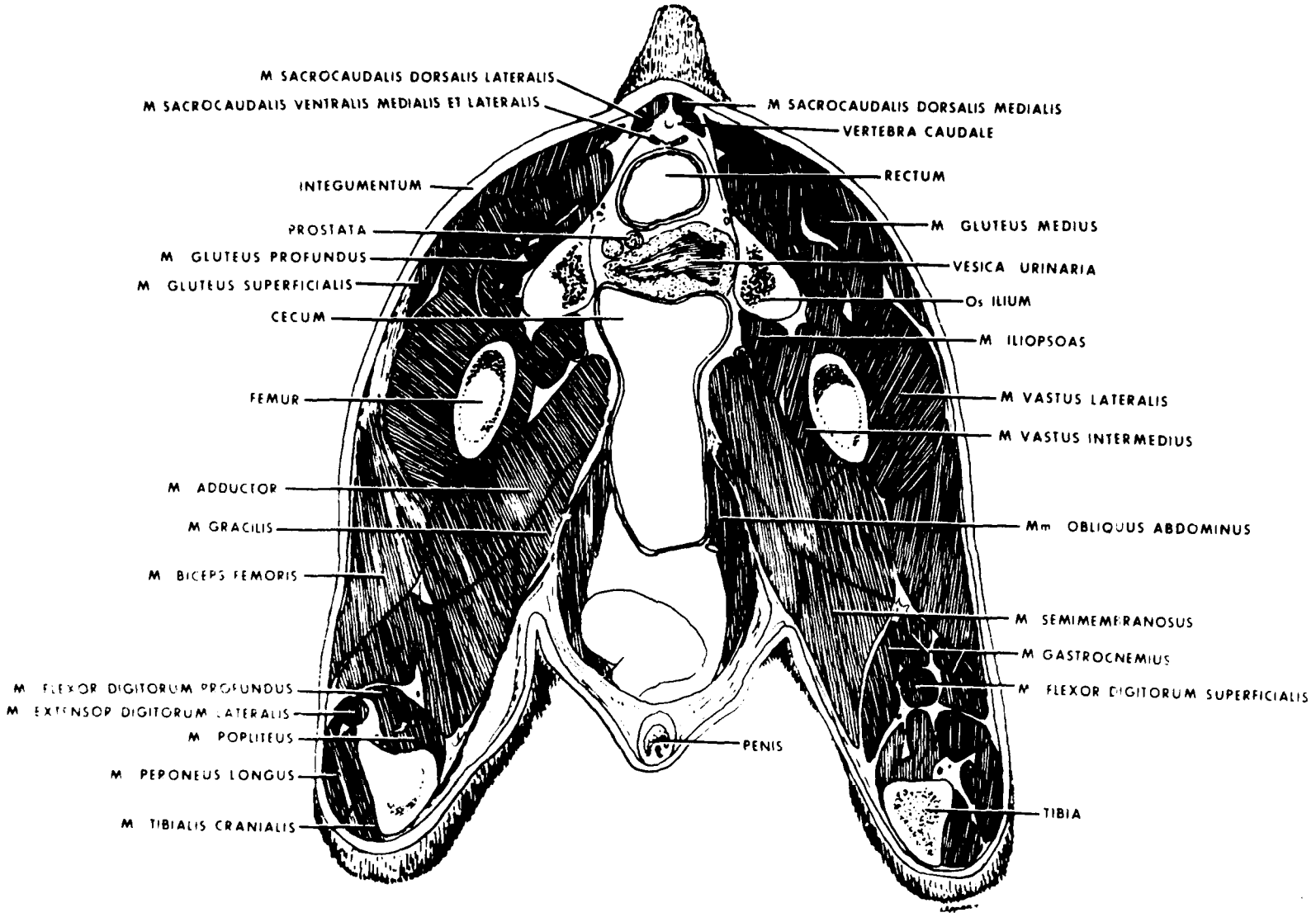


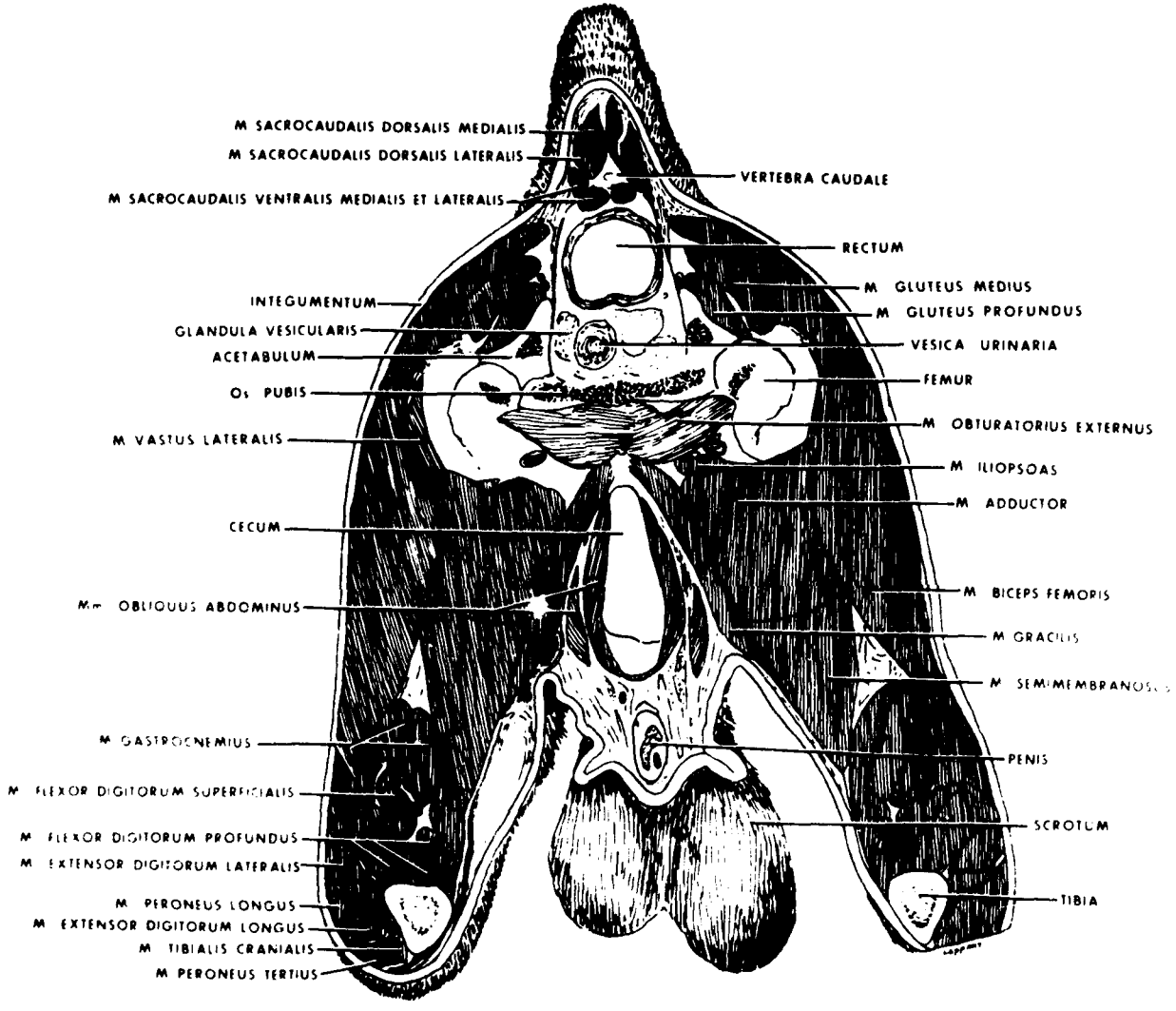
Section No. 48



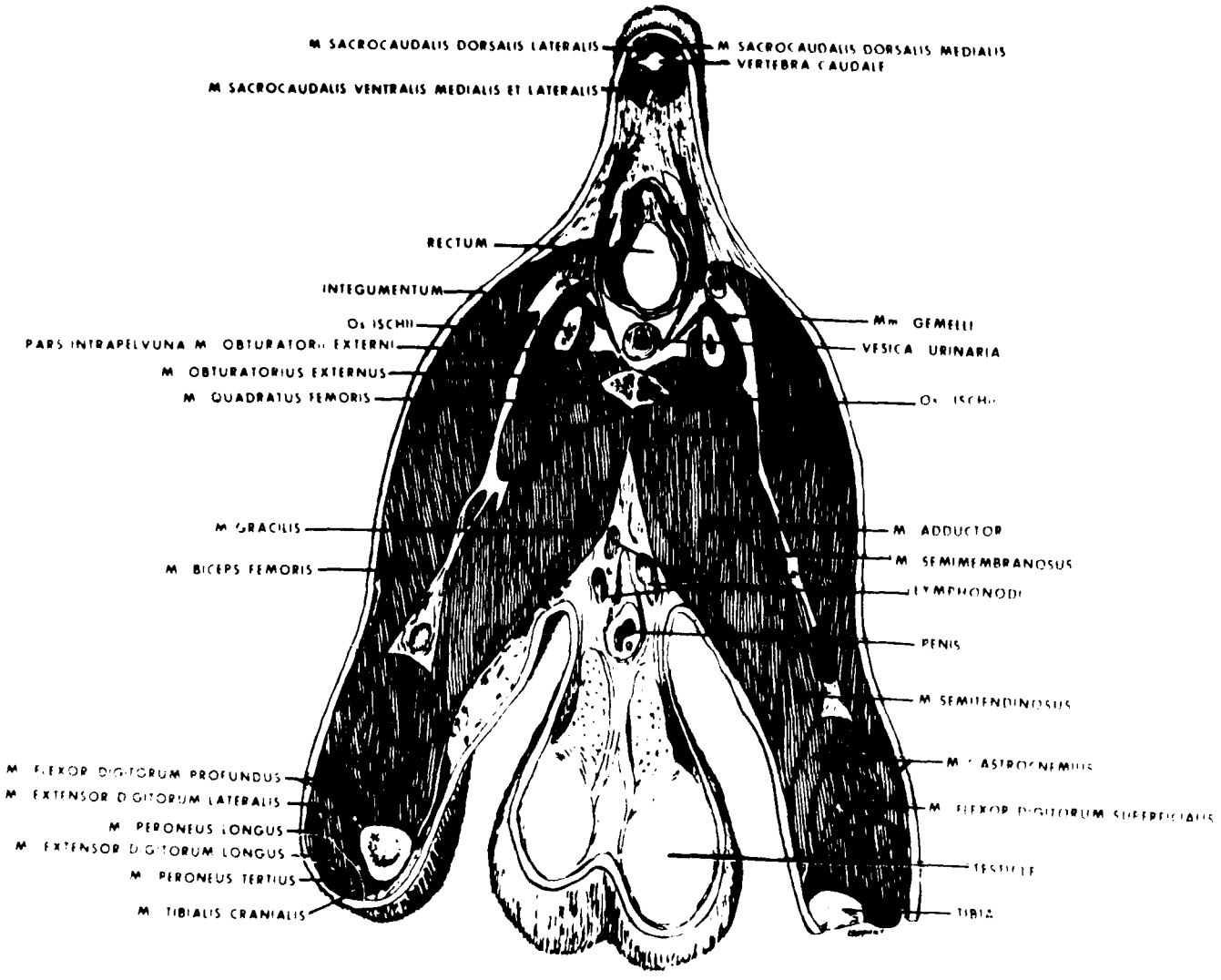
Section No. 49



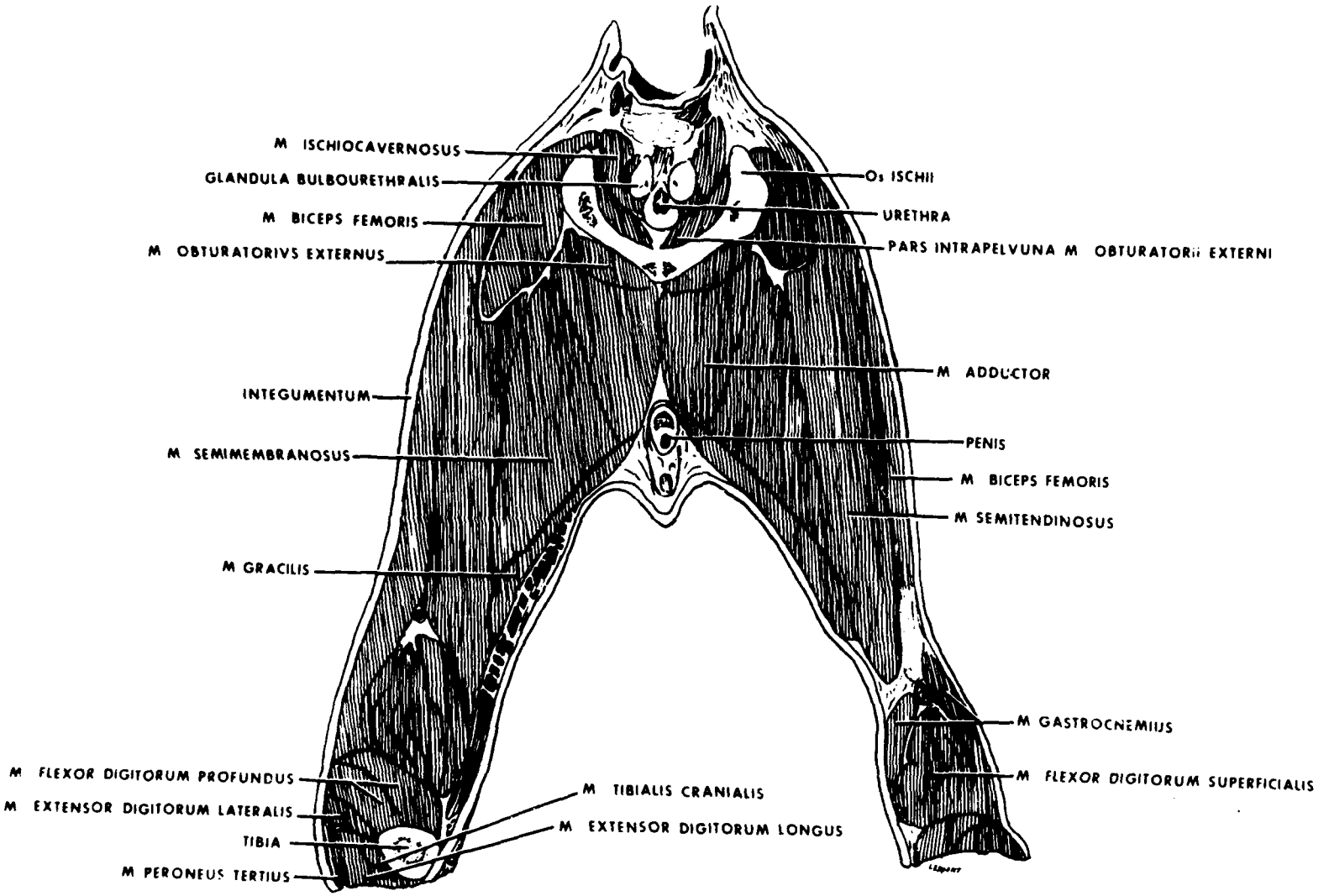
Section No. 50



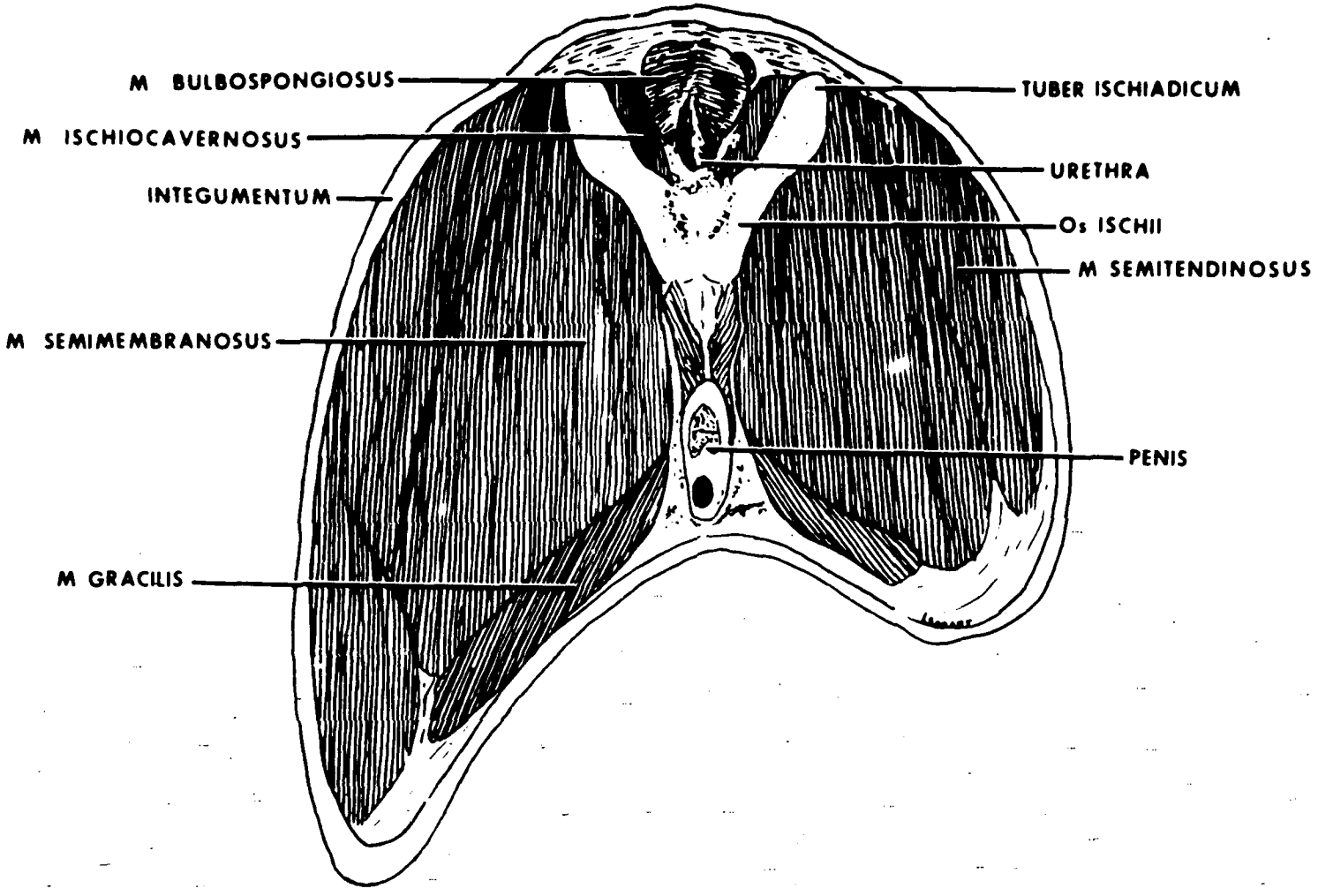
Section No. 51



Section No. 52



Section No. 53



Section No. 54