FOLIA PARASITOLOGICA (PRAHA) 27: 39—46, 1980.

A MORPHOLOGICAL STUDY ON HYDATIDS OF ECHINOCOCCUS GRANULOSUS (BATSCH, 1786) FROM PIGS

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Abstract. The present paper reports on the results of studies on 108 cases of hydatidosis in the pig undertaken for the purpose of obtaining an understanding of changes in the shape of the larva of *Echinococcus granulosus* (Batsch, 1786). A method was designed for making casts of the hydatid cavity which facilitated studies on its morphology. On the basis of our results we distinguished seven variants of hydatidosis (simple and multiple) in the liver of the pig. Frequently, the macroscopic appearance of hydatids was dependent on the weight and the age of the animal. Regressively changed hydatids occurred more often in heavier animals. These hydatids were unilocular and frequently their structure was typical of that of a cyst with a smooth wall (Group I). Group II received hydatids with differently big pouches in their wall which, however, did not change the standard, spherical shape of the cyst (lobular form). Group III accommodated hydatids with multiply and complicatedly pouching walls (multilobular form). The number of hydatids in the liver of the animals examined varied from their solitary to their multiple incidence (close to 100 hydatids in one liver). We found both sterile and fertile hydatids, and observed their regressive changes. The study has been complemented with a survey of terms used for larval forms of *Echinococcus granulosus* in the literature, and descriptions of four basic types of hydatidosis.

Our morphological study on hydatids of the cestode *Echinococcus granulosus* (Batsch, 1786) in the pig has been undertaken with a view of obtaining information on changes in the shape of unilocular cysts with pouching walls. Pouches might either be innumerous and shallow, or numerous and deep, in the latter case being responsible for a noticeable asymmetry in the structure of the cyst. Their central cavity enters peripheral loculi. From the outside, the irregular shape of the cavity is obscured by a prominent sheath enclosing the individual cysts (Plate III, Figs. 3, 4). Similar cysts might be found in an organ more heavily infected with a simple hydatidosis (echinococcosis), but are more commonly present in an organ infected with a multiple hydatidosis.

MATERIALS AND METHODS

Origin of the material. The material used was obtained from 108 pigs killed at the Warsaw abattoir in Poland in 1972. The pigs originated from various places of the Warsaw district. The material was collected on two occasions, first during 6 days in March, secondly during 11 days in August. An estimate was made of the approximate age of each intermediate host on the basis of weight records of each pig infested with hydatids, but this could be done only in a theoretical relation to the known weight categories. Of a total of 977 unilocular hydatids from the liver, 600 were sterile, 150 fertile, 227 at a differently advanced stage of regression.

In addition, we recovered 11 hydatids from the lungs of 5 intermediate hosts. Of these, 4 were sterile, 5 fertile, one at an advanced state of regression, one regressed completely. All intermediate hosts belonged to higher weight categories (more than 200 kg) also indicating a higher age group. Our observation was in line with data in the veterinarian pathologico-anatomical literature. (Jelínek et al. 1962).

Fixation and preservation of the material. Hydatids and part of the surrounding liver parenchyma were removed immediately after the slaughter of each pig, fixed with 4 % formaldehyde neutralized with calcium carbonate and stored in glass vessels (volume 0.5 l and 1.0 l respectively). If the liver was heavily infested with hydatids it was sometimes difficult to remove with the hydatid part of the surrounding liver parenchyma, because there was hardly any space left between the individual cysts.

Description of the method designed for making casts of the hydatid cavity. Casts were made of the cavity of several lobular and multilobular hydatids in order to obtain an understanding of the shape and size of pouching in their wall. The procedure of cast-making was this: First, all fluid was withdrawn with an injecting needle on a syringe. For larger hydatids, we used a syringe without a needle. Then, the cavity was filled either with plaster of Paris or Dentacryl (a fast hardening plastic) by injecting either substance into the hydatid, and 24 hr later, the connective tissue sheath and the wall of the hydatid were removed. With Dentacryl, the filling of the cavity had to be done with great speed to avoid an individual hardening of the injected doses. Such speed was not required of plaster of Paris, but casts made of this substance were extremely fragile and susceptible to mechanical damage. A factor important in the application of both substances was the inner diameter of the injecting needle and therefore it was necessary to use syringes without a needle for the filling of larger cysts.

We made of total of 46 casts of the cavities of hydatids obtained from 25 pigs; of these 17 were made of plaster of Paris, 29 of Dentacryl. Better results were obtained with Dentacryl, because they were perfectly hard and not fragile. Moreover, a Dentacryl cast made of the cavity of a fertile cyst illustrated more clearly the topography of brood capsules (Plate II, Fig. 2) than a plaster of Paris cast.

RESULTS

First, our material was evaluated with regard to the number of cysts in the organ, their location, size and shape, and the development of protoscoleces. In addition, we considered the location of hydatids in other organs, their homogeneity or heterogeneity in shape and size in the individual observations, their incidence and degree of regressive changes. Hydatids with simple pouches in their wall were designated as lobular, those with a complicated system of pouches multilobular. An understanding of the complicated structure of their cavity was obtained mainly from plastic casts. Of importance was our finding of fertile, large, multilobular cysts because it confirmed that even this morphological variant of a hydatid can complete its development in a similar way to that of a solitary, spherical, cyst. Pending on the results of our examinations, we divided our observations in seven groups (Table 1).

Table 1. Types of hydatidoses

Group	Type of hydatidosis	No. observations	Brief characteristics of the infection in the organ
I	simple	8	one or a few spherical cysts, regressive changes
II	simple	17	more cysts, some with pouching in their wall
III	multiple	33	numerous cysts; ununiform ratio of smooth to moderately lobular cysts
IV	multiple	12	numerous cysts, all multilobular in shape
V	multiple	5	smaller number of cysts of a different shape
VI	simple	6	one or a few multilobular cysts; regressive changes and resorptive nodules
VII	simple	6	predominantly unicystic; cysts large and multilobular

1. SIMPLE HYDATIDOSIS

It was fairly easy to evaluate this type of hydatidosis characterized by the incidence of either a solitary or a small number of unilocular cysts. In the first case, the solitary cyst was of appreciable size (up to 74 mm in diameter) and fertile (Plate I, Fig. 1). As it developed and increased in size, it came under pressure from the liver surface and was separated from the liver parenchyma by deep ridges. The hydatid was enveloped

in a thick layer of connective tissue which contained conspicuously calcified foci. Generally, solitary hydatids attained a large size and were fertile. At a diameter of 21 mm, hydatids were still sterile.

Frequently, an organ contained two, three and even four hydatids of a different size. Of interest was an observation made on several hydatids in which a single pouching of their wall disturbed the symmetry of their cystic shape. These hydatids were mostly fertile and measured 20—70 mm in diameter. Twice we hit a pair of hydatids in close contact with one another. One pair of hydatids, of which the bigger was fertile, the smaller sterile, contacted one another over a small area of their wall; their capsules passed slightly over the separating ridge. The other pair was located deeper in the liver parenchyma. The septum between the hydatids was greatly attenuated. Twice we found solitary hydatids showing typical signs of a starting regression. Both hydatids, one measuring 54 mm, one 42 mm, were filled with a glassy substance gelatinous in its consistence in which folds of the original laminated membrane could still be seen (Plate I, Fig. 2).

2. SIMPLE HYDATIDOSIS WITH A LARGER NUMBER OF HYDATIDS

In this group, the number of hydatids ranged from 4—10. Hydatids were located more frequently in the liver parenchyma than under the liver capsule. Frequently, two hydatids were in close proximity, but still clearly separated from one another. Most of the hydatids were spherical in shape, but several, mainly the largest ones, were ellipsoid with either shallow or deep pouches in their wall. In some instances, clearly visible, sharply edged septa were seen to enter the hydatid cavity (Plate II, Fig. 1).

Sometimes, scars caused by an advanced regression were found along with still intact hydatids. Elsewhere, instead of a scar, we found a moderately lobular hydatid together with an appreciably smaller multilobular hydatid. In one case, we recovered from the liver an almost spherical cyst with a minute pouch, and from the lung two smaller hydatids. One of these was fertile and possessed two cavities, the other was multilobular and at a state of regression.

3. MULTIPLE HYDATIDOSIS OF A MIXED TYPE

This group received cases either with a numerous incidence of cysts in the organ or those of a multiple hydatidosis. Generally, hydatids were small and sterile, almost spherical in shape. In several cases, distinctly developed but not too numerous pouches could be seen on a certain number of hydatids (Plate II, Fig. 2). Frequently, the pouches were so well separated from one another that minute septa could be seen to enter the hydatid cavity. Sometimes, we found a hydatid with two equally large and widely communicating cavities (Plate II, Figs. 3, 4).

In a heavily infested organ, some of the hydatids were remarkably multilobular and there were deep and branching pouches in their walls. Distinct septa entered irregularly in different directions the cavity of the cyst which appeared in section as if it were racemose. Hydatids at a differently advanced state of regression were found together with these multilobular cysts.

4. MULTIPLE MULTILOBULAR HYDATIDOSIS

Multilobular hydatids were frequently present in the liver of several pigs (Plate III, Figs. 1, 2). Their complicated and irregular structure could be understood only if casts of their cavities were available (Plate II, Figs. 3, 4). Already the outline of a multi-

lobular cyst below the capsule suggested its complicated form. Moreover, its shape was emphasized by a ridge separating the hydatid from the liver tissue (Plate II, Figs. 6, 7). Although many hydatids were at a phase of regression, their original complicated shape was still distinguishable.

Of importance was the finding of a simultaneous incidence of several small, typically multilobular hydatids and one big and fertile multilobular hydatid. This provided evidence for the fact that even in the case of a massive incidence of distinctly multilobular cysts the majority succumbed to regression, while one of these only attained a considerable size and still retained its multilobular shape.

5. MULTIPLE HYDATIDOSIS WITH AN INCIDENCE OF IRREGULARLY SHAPED HYDATIDS

This group received observations of hydatidosis characterized by the presence of a smaller number of cysts of a larger size of which many were fertile. Several hydatids, mainly smaller ones, were spherical or with pouches in their walls. Larger cysts were typically multilobular in shape. Casts of their cavities gave a clear picture of their shape.

6. SIMPLE MULTILOBULAR HYDATIDOSIS WITH THE FINDING OF RESORPTIVE NODULES

In this group we placed 6 observations characterized by large multilobular hydatids in the liver. Once, we found a large, multilobular, fertile hydatid measuring about 10 mm in diameter (Plate IV). One of its halves was almost spherical, the other was largely pouching at the opposite end. The cuticular membrane was considerably thick, the parasite was at a state of a starting regression (Plate IV, Fig. 2). Regression was complete in other hydatids located close to the large cyst (Plate IV, Fig. 1). The largest of these hydatids (27 mm in diameter), was elevated above the liver surface. The sheath of connective tissue enclosing this parasite was joined to that enclosing the large hydatid. Regressively changed foci projecting in its vicinity, were remnants of 5 other disintegrated hydatids. This finding demonstrated that several neighbouring hydatids had been affected by regression, while one hydatid cyst developed to an appreciable size. The diameter of regressive foci indicated that several of these cysts had been of a considerable size and had influenced the production of a pouch at the adjacent end of the large cyst.

Another large, multilobular hydatid cyst was recovered from another pig. Its central cavity measuring 30×76×29 mm (Plate V, Fig. 1) was extending into several lateral pouches of which the smallest measured 3×5 mm, the largest 22×21 mm in diameter. The cyst was fertile and there were considerably less brood capsules in the pouches than in the central cavity. Regressive changes in the cyst were indicated by a thickening of the hyalinoid membrane. They appeared in the form of blisters projecting into the cavity. In the same organ we found a fertile cyst measuring 32 mm in diameter, and also a regressive focus (13 mm in diameter).

From another pig, we recovered a larger, elongate, hydatid cyst with several deep pouches in its wall. The pouches contained a small number of brood capsules. The cyst was fertile. The pouches measured 18×16 mm, 13×12 mm, 13×11 mm respectively. In addition, the liver of the animal contained three multilobular hydatid cysts at an advanced state of regression. These measured less than 10 mm in diameter.

In the next case, we found two multilobular, fertile, cysts of a medium size (more than 40 mm in length), and deeper down in the liver parenchyma there was a minute nodule containing a regressively changed hydatid.

The liver of another pig contained fertile, multilobular cysts. One of these was located

at the liver margin, two were arising above its surface. Casts made of their cavities disclosed their shape (Plate VI, Figs. 3, 4, 5). The liver of this animal contained also a small, lobate cyst (11 mm in diameter), and a regressive focus (4.7 mm in diameter).

In the last case, we found a sterile, multilobular, hydatid cyst of medium size enclosed by a thick sheath of connective tissue (3.5 mm). In addition, the lung of this animal contained a focus with a shrivelled and regressively changes hydatid cyst.

7. SIMPLE MULTILOBULAR HYDATIDOSIS

The group received an observation of a unicystic (in one case there were two cysts) multilobular form of hydatidosis. Hydatid cysts of a medium size were sterile, larger cysts were fertile (Plate VI, Figs. 1, 2). Casts of their cavities disclosed even impressions of their brood capsules. In one case with an incidence of two large, multilobular, cysts, brood capsules were seen to be irregularly distributed in various parts of their cavities (Plate V, Fig. 2). This was particularly conspicuous in a major portion of one cyst which was elevated above the surface of the liver.

DISCUSSION

Having regard to a considerable discrepancy in terms used for the designation of hydatid cysts of *Echinococcus granulosus* in the medical and veterinary literature, these will be surveyed and explained in the following text. Differences in the appearance and structure of hydatid cysts from animals with hydatidosis (larval echinococcosis) brought forth the term echinococcus polymorphus, which nowadays is in little use. The term echinococcus cysticus expressed the cystic appearance of the larva. The presence of daughter cysts (hydatids) in the hydatid cyst initiated the use of the term echinococcus hydatidosus. In this connection, the disease was called hydatid echinoccocosis or hydatidosis, and the primary cyst produced by the oncosphere was called a hydatid cyst. Because this cyst possessed one cavity with a smooth wall, it was called echinococcus unilocularis, a name introduced by Huber (1896) and used by Abuladze (1964).

Klobouk (1933) recorded other variants of this larval form in his survey. Hydatid cysts from man were called echinococcus hominis and also echinococcus altriciparіens apparently in association with the fact that the production of daughter cysts which themselves produced protoscoleces, was frequently observed in hydatid cysts from man.

In order to distinguish hydatid cysts in animals from those in man, the former were called echinococcus veterinorum. The synonym of this name, echinococcus scoliciparіens—was evidently suggested to emphasize the fact that a hydatid cyst from animals produced only protoscoleces, but not secondary or tertiary daughter cysts (hydatids). Occasionally, the term echinococcus simplex was used for solitary hydatid cysts from animals which did not contain daughter cysts. This terminological division came out of use when knowledge was made available of the fact that daughter cysts can also be produced by hydatid cysts from animals.

The absence of protoscoleces in a hydatid cyst which might also produce an occasional daughter cyst, brought forth the term echinococcus sterilis (acephalocyst). However, in this case, it should be remembered that the hydatid cyst has to be of a certain age before it can produce protoscoleces and also, that protoscoleces might disintegrate and disappear from the contents of very old cysts. The term used for hydatid cysts with protoscoleces was echinococcus cysticus fertilis.

The former practice to name a hydatid cyst by the name of the organ in which it found (e.g., echinococcus hepatis, echinococcus pulmonum) is no longer used. Preferably, these cases should be referred to as a primary hydatidosis of the liver or the lung, in contrast to a secondary hydatidosis characterized, e.g., by a rupture of the hydatid cyst, a dissemination of protoscoleces into the abdominal cavity and their attachment to the peritoneum.

According to Klobouk (1933), the mode of production of daughter cysts was responsible for the introduction of terms such as echinococcus hydatidosus designating a hydatid cyst with an endogenous production of daughter cysts, and echinococcus granulosus, characterized by an exogenous production of daughter cysts on the outer surface of the hydatid cyst. The latter being the rarest larval form, its name should not be confused with the zoological name of the adult cestode *Echinococcus granulosus* (Batsch, 1786), because the discussed names have been used exclusively for hydatids of this species.

Variations in the appearance of larval forms of *E. granulosus* from domestic animals and man impeded greatly a morphological evaluation of a massive infection with this parasite in the organs. A massive, but not excessive incidence of larval cysts known as echinococcus multix, can readily be distinguished from echinococcus simplex characterized by the presence of a single hydatid cyst. However, an excessive number of cysts in an organ packed so tightly with cysts that these are abutting one another, might already lead to the incidence of transitory forms. Dew (1953) used the term pleomorphism or morphological variations (Dew 1958) for this phenomenon in a hydatid disease. Abnormal forms of hydatid cysts were pointed out by Cameron (1927). In agreement with the cited authors, also Euzéby (1960) distinguished three pathologico-anatomical pictures of a massive hydatidosis on the basis of the type of cyst. The first form characterized by the incidence of one or a limitid number of hydatid cysts each separated distinctly from the other by its own enveloping sheath of connective tissue, was regarded by him as obligatory. He suggested the name unilocular univesicular or unicystic hydatidosis for this form. Euzéby (1962) talked also of a hydatidose form, evidently meaning a disease caused by *E. granulosus* (Batsch, 1786). The next form, a multicystic or multivesicular hydatidosis, was characterized by the presence of a larger number of adjoining hydatid cysts of which each was enclosed in its own sheath of connective tissue. Euzéby (1962) arranged it to the first described form and suggested that its origin might be ascribed to the production of exogenous daughter cysts. Another form suggested by Euzéby (1960, 1962) was a multilocular hydatidosis characterized by multilocular cysts shaped as small vesicles which contacted and communicated with one another and were situated in a common connective tissue stroma. Euzéby (1962) maintained that a degenerative transformation of this form brought forth the origin of an alveolar hydatidosis expansive in its growth and generally sterile.

Difficulties in a morphological evaluation of hydatidosis arise from the uniform appearance of a multiple hydatidosis in various species of domestic animals and man. In spite of differences in opinions, it has been possible to distinguish these variants of hydatidosis:

1. Simple hydatidosis. This form is characterized by the incidence of either a solitary or a small number of unilocular (univesicular) hydatid cysts. Some of these cysts, particularly those from sheep, but sometimes also those from bovines, the pig and man, have been shown to be non-spherical in shape and their wall not to be smooth. Dew (1925) maintained that pouches in the cyst wall might attain such a size that the cyst appears as if multilocular. He suggested that the pouching of the hydatid wall was initiated by its growth into sites without structures in which resistance was increased. He regarded as resistant structures strips of fibrous connective tissue, large vessels and mainly bile ducts enveloped for a prolonged period in their sheath of connective tissue. We used the term lobular cysts for hydatid cysts with a moderate degree of pouching. They were demonstrated by Hutchison and Bryan (1960) and already Leuckart (1879—1886) referred to them as "gebuchteter *Echinococcus*".

2. Multiple hydatidosis is characterized by the finding of a number of multilocular cysts in a heavily infested organ. The central cavity of these cysts enters loculi of a different size which are separated by incomplete septa and communicate with the central cavity. This form originates from an uneven growth of the hydatid wall along its entire periphery. Information on factors responsible for an ununiform growth of the hydatid wall is still incomplete. Even secondary cysts might be produced in the direction of the growth of an excessively growing hydatid cyst. Also various drawings available from the pertinent literature have shown that multilocular hydatid cysts are frequently dominant in a heavily infested organ. Dew (1953) maintained that variation in the shape of hydatid cysts occurred because they were tightly packed in the organ, merged and one cyst was growing into the other. Multilocular cysts of this type are common in domestic pigs (classical drawing in the textbook by Cohrs 1952), wild pigs (e.g., Hutchison 1960) and sheep (e.g., Dew 1953, 1958). Although each cyst is enclosed in a sheath of connective tissue, they might coalesce if their incidence in the organ or in part of the organ is massive. Included in this type are also multiple lesions figured by Dew (1958, Fig. 504) for bovines and incorrectly called multicystic. Sometimes groups or clusters of small and apparently separated cysts of a different size covered with a connective tissue sheath have been observed in sheep. However, a communication between them has not been disclosed sofar. This type of hydatid cyst occurs frequently in the liver of bovines, less frequently in pigs and occasionally in equines. We have used the name multilobular cyst for hydatid cysts with complicated pouches in their wall which communicate by means of loculi. Degenerative changes in these lesions are generally common.

3. Multicystic hydatidosis. This form, not frequently found in sheep, is characterized by a conglomeration of minute, individual hydatid cysts enclosed in a solid fibrous stroma. Frequently, their presence in the liver and the lung is associated with that of simple hydatids. Involutional changes are common. Several authors suggested an exogenous budding and a separation of minute cysts analogous to an osseous hydatidosis in man. This form occurs sporadically in horse and pig, but is typically developed in bovines, mainly in the liver. Hydatid cysts of this form are small (optimum about 1 cm in diameter). Small, fibrous septa separate the individual cysts. The parasite is generally

degenerate. The reaction of the host occurs mostly in three zones. Apparently for the fact that this form has been called *Echinococcus multilocularis*, Cameron (1927) erroneously referred to this form as to a multilocular hydatidosis. Having regard to the fact that its etiology is still obscure, studies on this subject which might elucidate the genesis of this form, were recommended by "Reports from a meeting of research workers on echinococcosis (hydatidosis)" held in Geneva from December 6—12, 1966. Sometimes, the name *E. multilocularis* has been used for this form of hydatidosis in domestic animals and thus identified as a true alveococcus. However, the problem is still open and therefore, it cannot be said for certain, whether the form is not a variant of a unicystic hydatid. For this reason, Bregadze and Konstantinov (1963) recommended the name echinococcus multicysticus or echinococcus multivesicularis for this form.

4. Alveolar hydatidosis known as alveolar hydatid disease in the Anglo-Saxon literature, as alveolar echinococcosis or alveococcosis in the Soviet literature, is an infection caused by the cestode *Alveococcus multilocularis* (Leuckart, 1863) Abuladze, 1960. Syn.: *Taenia multilocularis* Leuckart, 1863; *Echinococcus multilocularis hepatis* (Leuckart, 1863) Haffter, 1875. Other synonyms are given by Abuladze (1964). This form of hydatidosis occurs predominantly in small rodents, the natural intermediate hosts of this parasite.

Acknowledgements. The author thanks Dr. J. Šlais D. Sc. Head, Department of special diagnostics, Medical School Hospital, Plzeň, for his advice and suggestions during this investigation, and for his helpful criticism of an early draft of the manuscript.

МОРФОЛОГИЧЕСКОЕ ИЗУЧЕНИЕ ГИДАТИДНЫХ ЦИСТ ПРИ ГИДАТИДОЗЕ СВИНЕЙ, ВЫЗЫВАЕМОМ *ECHINOCOCCUS GRANULOSUS* (BATSCH, 1786)

М. Ванек

Резюме. Автор изучал 108 случаев заболевания гидатидозом свиней с целью обнаружить изменчивость формы личиночной стадии *Echinococcus granulosus* (Batsch, 1786). Разработан метод приготовления отливок полостей гидатидных цист, который оправдал себя при изучении их морфологии. В изучаемом материале отличается семь вариантов простого и сложного гидатидоза печени свиней. Макроскопический вид цист часто находится в связи с весом или возрастом животного. У более тяжелых свиней чаще встречались цисты с регрессивными изменениями. Во всех случаях гидатидные цисты были унилокулярные, часто с типичным строением цист с гладкой стенкой (1-я группа). На стенках цист 2-й группы образовались различные выпукления, но их круглая форма сохранялась (дольчатая форма). На стенках цист 3-й группы были многочисленные и сложные выпукления (многодольчатая форма). Количество цист в печени изучаемых животных было разнообразно, от отдельных цист до массивного заражения (почти 100 цист в печени). Была исследована также стерильность и плодородие цист и их регрессивные изменения. Дан также обзор применяемых в литературе названий личиночной формы *E. granulosus* и описание четырех основных типов гидатидоза.

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Received 7 February 1979.

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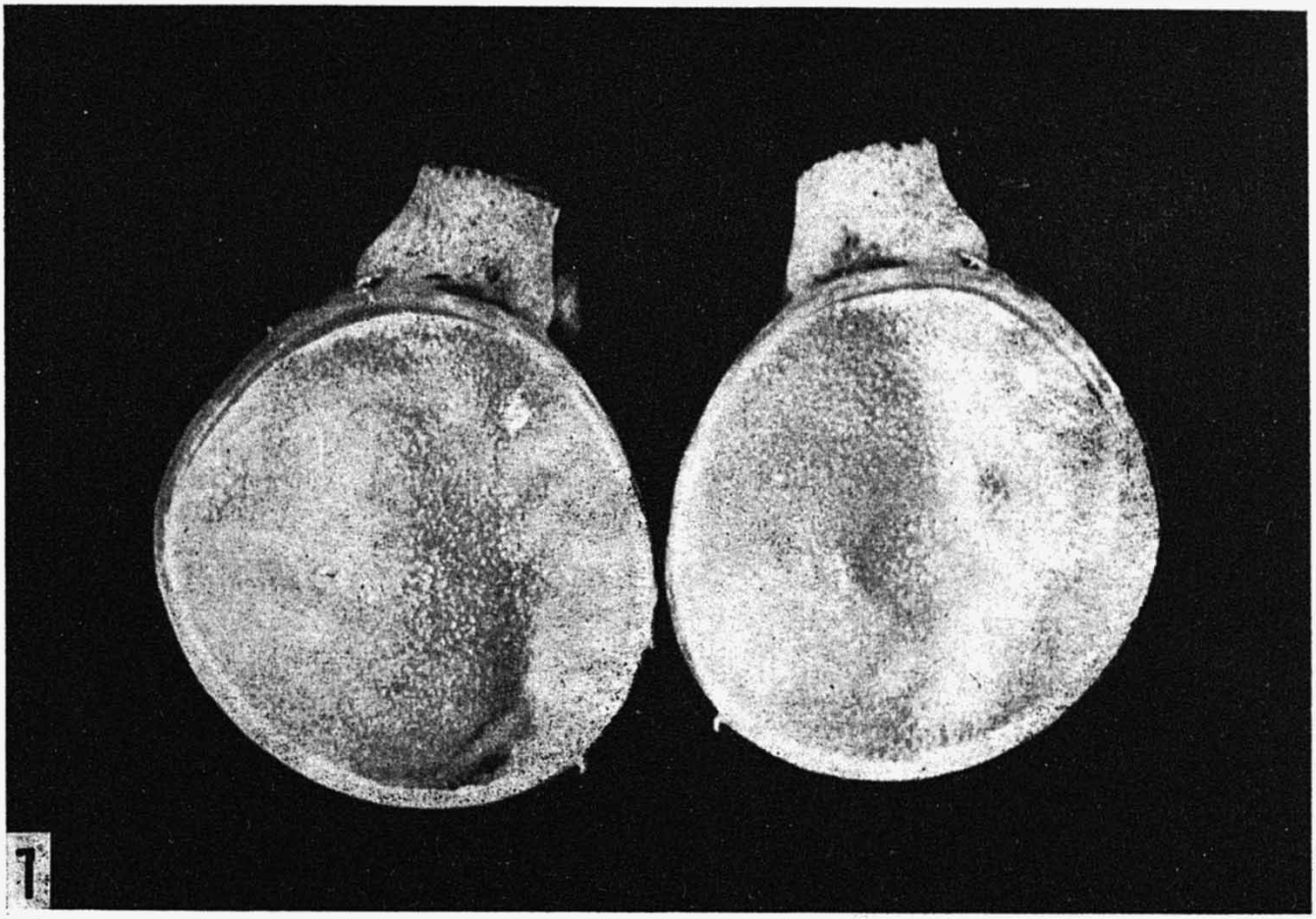
FOLIA PARASITOLOGICA (PRAHA) 27: 46, 1980.

J. E. Keirans, C. M. Clifford: The genus Ixodes in the United States: a scanning electron microscope study and key to the adults. *J. Med. Entomol. Supplement No. 2, Honolulu 1978, 149 pp., 525 Figs. Price 12 $.*

The scanning electron microscope has proved to be useful in biology primarily in studies of morphological structures, consequently involving also taxonomic conclusions. The reviewed book serves as an example of the way this method is used, and is primarily of pictorial character. Over 500 photomicrographs of very good quality show morphological details, particularly of capitulum, scutum, spiracle and coxae of 35 North American species. The SEM pictures were very well applied in the introductory key to both sexes. In the following part of the book the species are arranged alphabetically and with each are given the synonymy, distribution, hosts, citation of original literature for descriptions of adults, nymphs, and larvae, type-host and type-locality. The authors adhere to their systematic division of the genus, not recognizing *Ixodiopsis* and *Trichotoixodes* as distinct subgenera. Finally, the geographical distribution of the genus *Ixodes* in different states of the USA, depositories for type specimens of North American species, literature, index to tick species and index to hosts are presented.

It is a very successful publication which, in its brief form, provides important contemporary information for all who are engaged in the studies of ticks.

Dr. V. Černý, C.Sc.



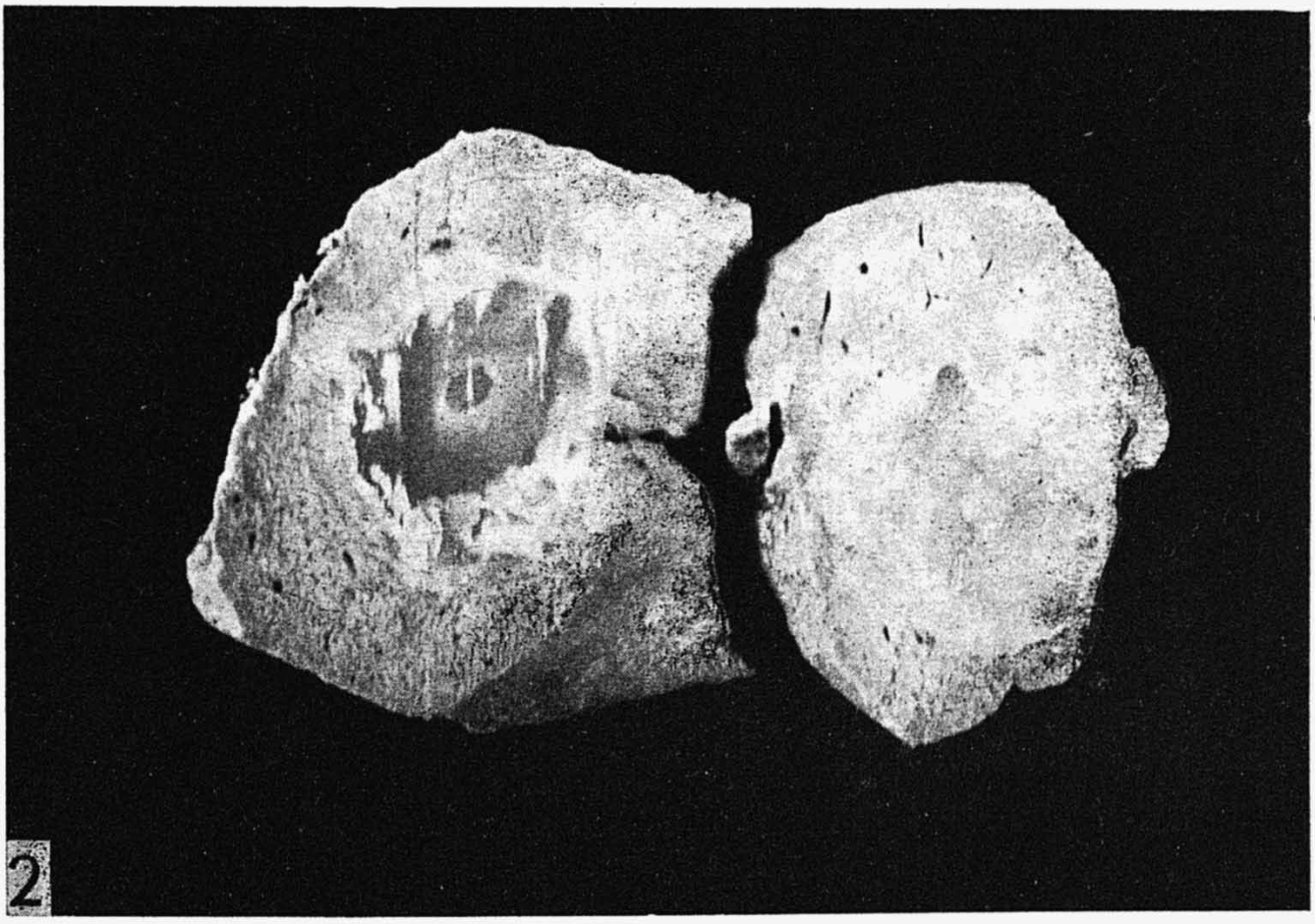


Fig. 1. Solitary, fertile, spherical, hydatid, 74 mm in diameter—simple hydatidosis of the liver.
Fig. 2. Regressively changed unilocular, spherical cyst filled with a gelatinous substance in which folds of the original, cuticular, laminated membrane are visible. 42 mm in diameter.

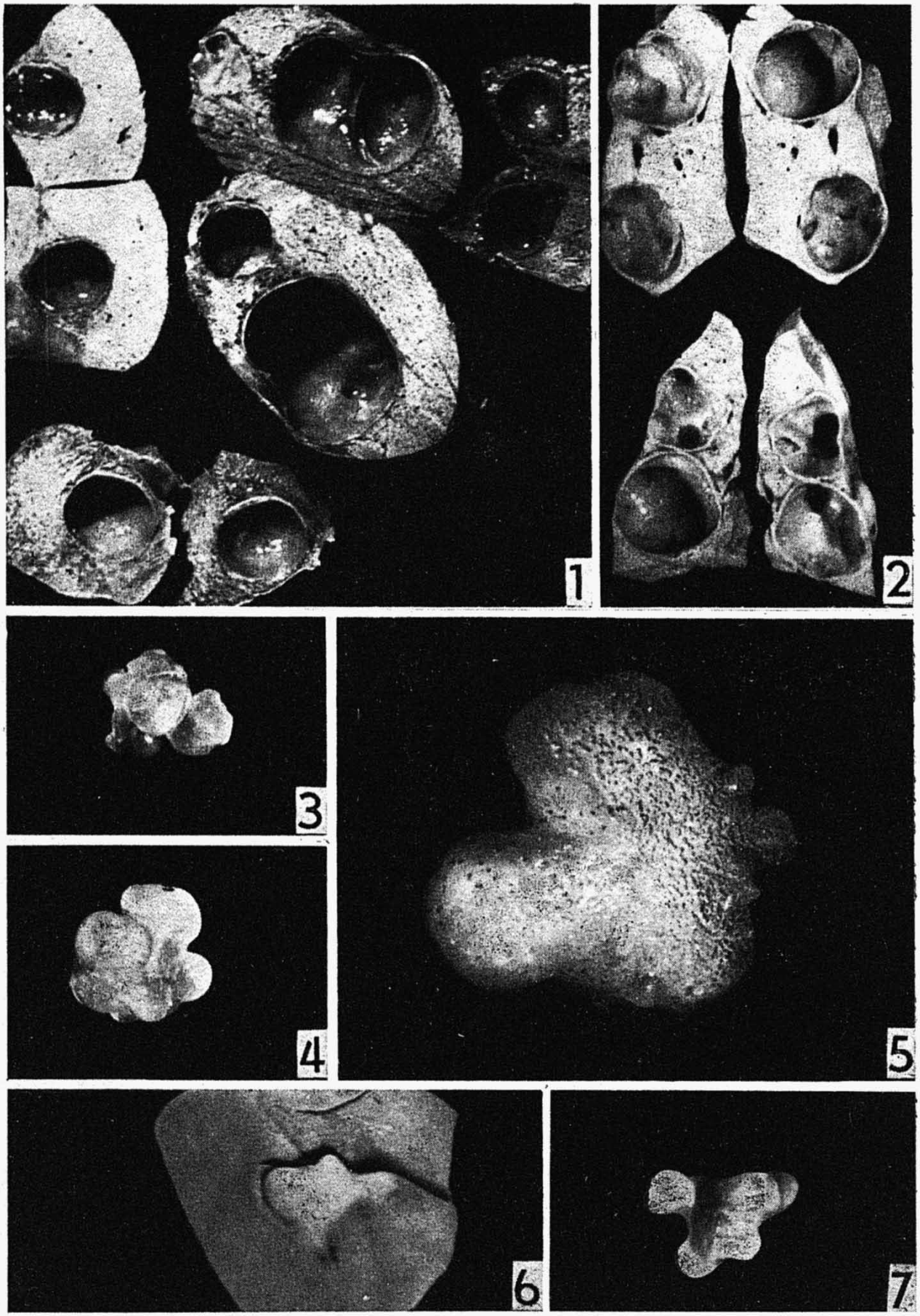


Fig. 1. Spherical cysts with a moderate pouching or even with septa between pouches, if the number of hydatids is bigger. Lobular type. Diameter of large hydatid in centre of figure 47.5 mm, diameters of remaining cysts from 25—27.5 mm.
Fig. 2. Multilobular hydatid cysts in a multiple hydatidosis of the mixed type. Cyst diameters from 25.5—32.5 mm.
Figs. 3, 4. Casts of cavities of multilobular cysts. Longest diameters 20 mm and 22 mm.
Fig. 5. Cast of the cavity of a bigger, fertile, multilobular hydatid showing the distribution of brood capsules. Size 53 × 49 mm.
Figs. 6, 7. Larger, multilobular, cyst, longest diameter 22 mm; cast of its cavity. Cyst located at margin of liver lobe.

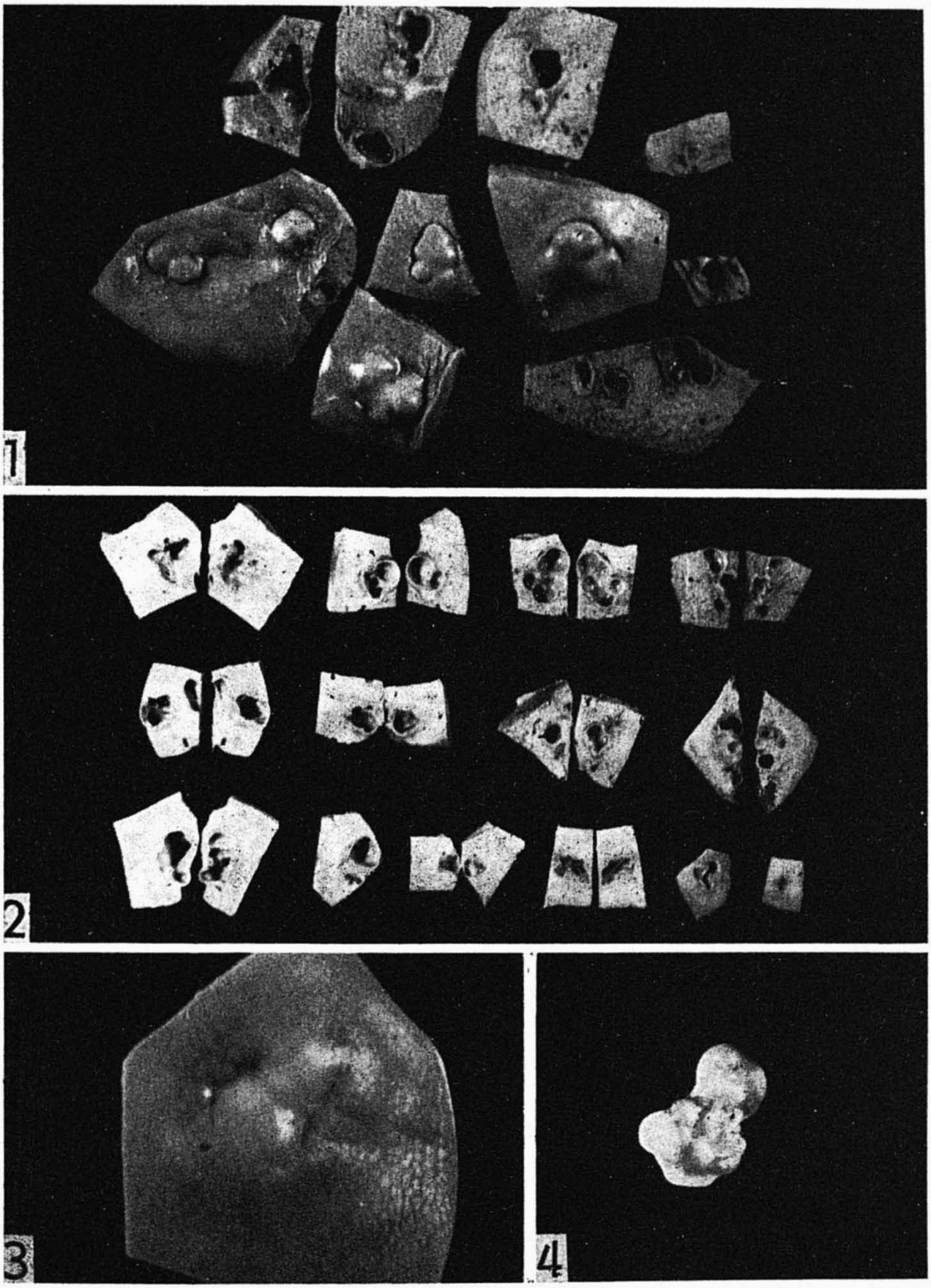


Fig. 1. Superficial appearance of cysts at a multiple, multilobular hydatidosis. Most cysts circumscribed by a ridge originating from pressure on the cyst growing under the liver capsule. Diameters from 7—21.5 mm.
Fig. 2. Multilobular cysts—multiple hydatidosis. Cysts located deeper in the liver parenchyma. The complicated arrangement of the cyst cavity is seen in section. Cyst diameters from 6—23 mm.
Figs. 3, 4. Multilobular cyst moderately elevated above liver surface; cast showing its complicated structure. Size 20 × 15 mm.

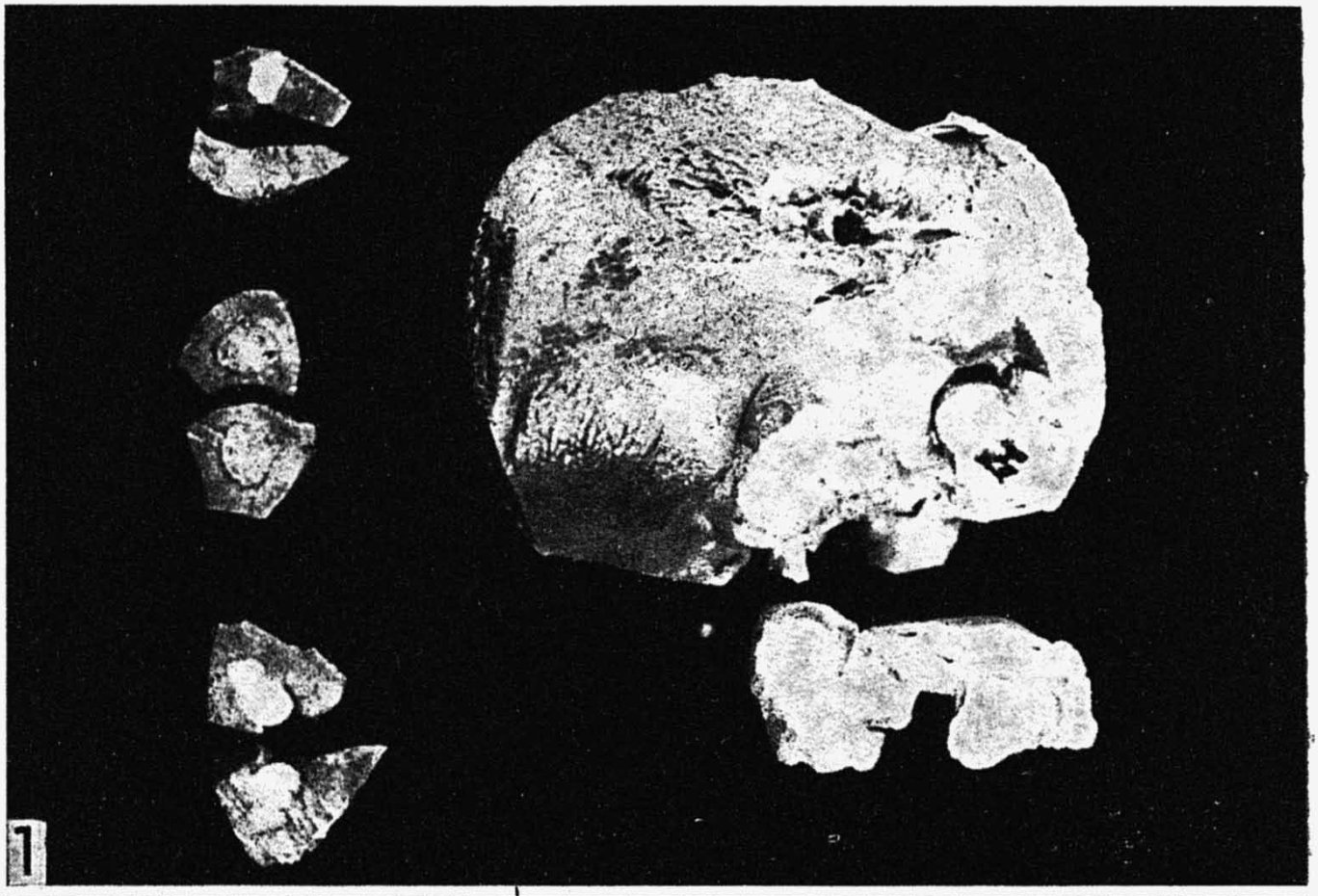
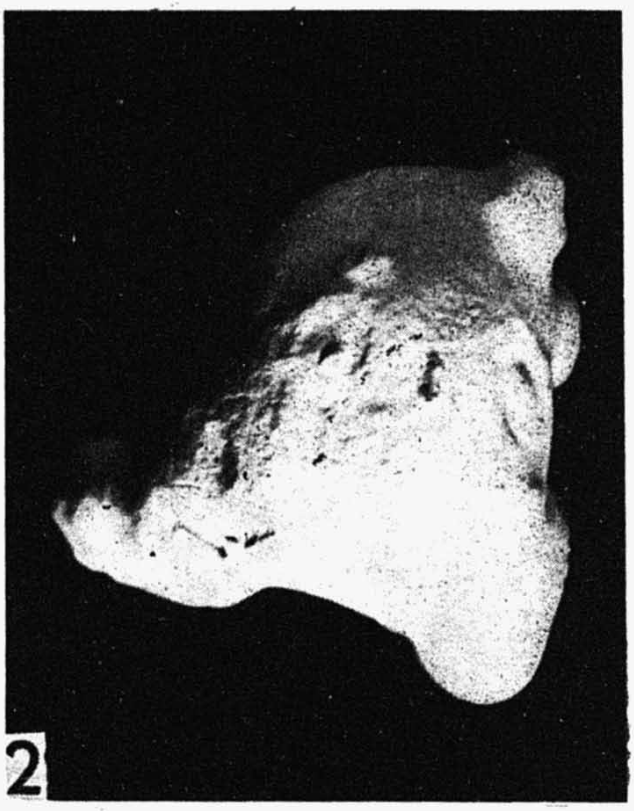
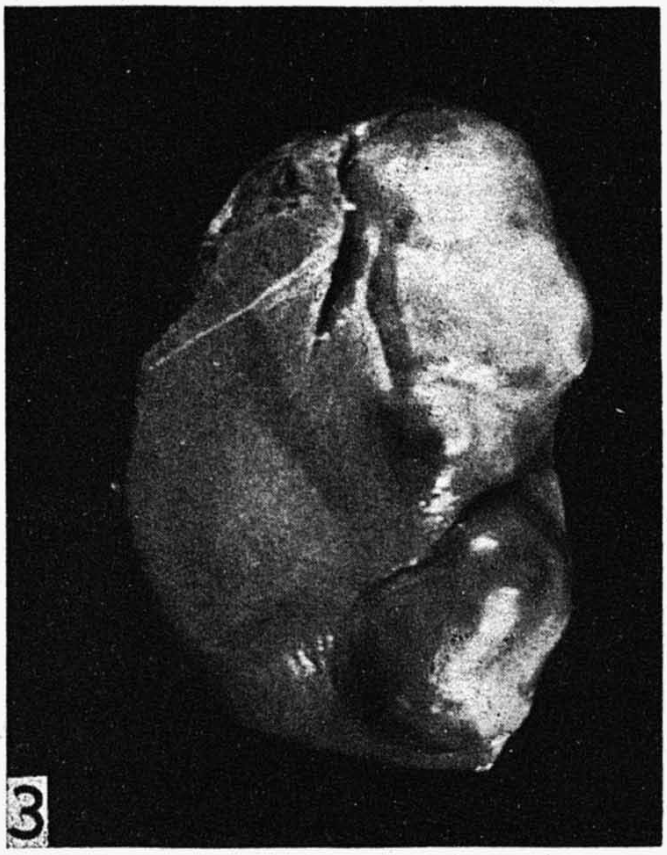


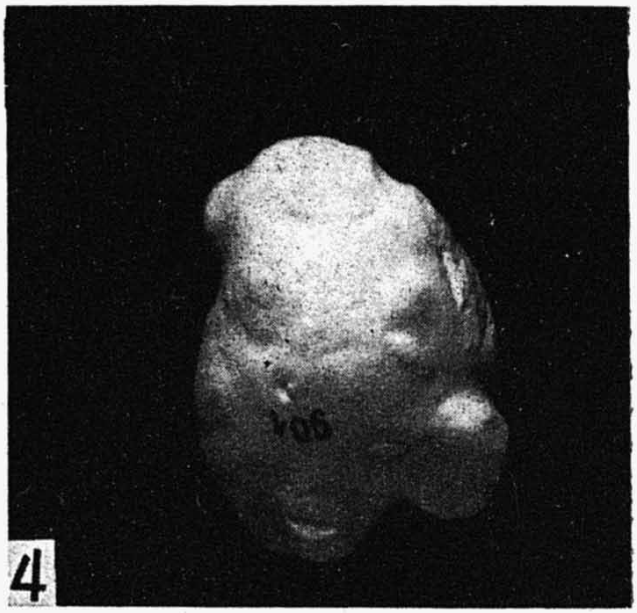
Fig. 1. Regressively changed cysts adjoining one end of oval, fertile cyst and influencing the production of large pouches in the wall. In the vicinity scars remaining from hydatids, three on the left side of the picture.

Fig. 2. Section through the main hydatid: its hyalinoid membrane is at a phase of advanced regression. Sheath of connective tissue partly peeled off during preparation. Longer diameter 10 cm.

Fig. 1. Large, multilobular, fertile, hydatid with a central cavity measuring 30 × 76 × 29 mm. Number of brood capsules in lateral pouches remarkably reduced. A swelling of the regressively changing hyalinoid membrane produces blisters on the inner surface of the hydatid.
Fig. 2. Asymmetric distribution of brood capsules in the individual parts of cavities of two multilobular cysts. Note the remarkably small number of brood capsules in the large portion of the hydatid arising conspicuously above the liver surface (cyst on the right). Diameter of cyst: 41.5 cm.







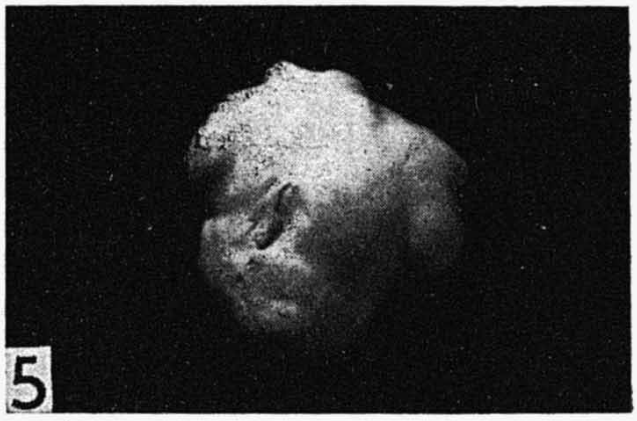


Fig. 1. Unicystic, multilobular hydatid. Sometimes, pouches in the walls of larger cysts are less clearly separated from the main cavity as evident from the cast in **Fig. 2.** Size 52 × 60 mm.
Figs. 3, 4, 5. Two neighbouring, fertile, multilobular, cysts of a simple, multilobular hydatidosis with resorptive nodules elevated more conspicuously above the liver surface; plaster casts of their cavities. Measurements 41 × 30 mm and 28 × 28 mm respectively.