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Case report

Mesotheliomas of the tunica vaginalis testis and hernial sacs

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Summary. Three histologically and immunohistochemically well-documented cases of mesothelioma of the tunica vaginalis testis and hernial sac are presented. Analysis and follow-up data on our three patients and a review of 30 previously reported cases have revealed a varied and often unpredictable clinical course. A classification into high- and lowgrade malignant tumours is suggested, based on clinical and pathological findings.

Key words: Mesothelioma – Tunica vaginalis testis – Hernial sac

Introduction

Mesotheliomas are tumours arising from the serosal membranes of the original coelomic cavities. In rare cases proliferation of the serosal cells of the tunica vaginalis testis and/or a hernial sac may exhibit neoplastic features without involvement of the larger serosal cavities. Since the biological behavior of these tumours is still unpredictable and unsettled, we present three mesotheliomas in this location with a varied clinical course.

Case reports

Case 1. A 58-year-old man without evidence of asbestos exposure presented with an increasing left-sided hydrocoele. Surgical exploration revealed 250 ml serous hydrocoele fluid. The tunica vaginalis testis was thickened and covered with several excrescences varying from 2 to 6 mm in diameter. An inguinal orchiectomy was performed. A diagnosis of mesothelioma was made on microscopic examination (Figs. 1, 2). Testis and epididymis were unremarkable, and no other sign of malignant tumour was found. The patient is well and without signs of recurrence 9 years after the operation.

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Case 2. A 66-year-old carpenter with a 10-year history of asbestos exposure, was admitted to the hospital with a painful, right scrotal swelling, that had been present for 2 years. An inguinal orchiectomy was carried out. The testis and epididymis appeared normal. The tunica vaginalis testis was thickened and covered with multiple, 2–3 mm large, papillary excrescences. Microscopic examination revealed a mesothelioma (Figs. 3, 4), which seemed completely removed. There was no sign of intraperitoneal tumour. Two years later the patient was readmitted with a $10 \times 5 \times 2$ cm mass in the soft tissues and skin in the right inguinal area. A wide excision was made together with dissection of several enlarged inguinal and retroperitoneal lymph nodes. There were still no signs of intraperitoneal involvement and no further treatment was instituted.

During the following six months the patient developed a $4 \times 3 \times 1.5$ cm large, deeply seated mass in the right groin. A CT-guided needle aspiration from the lesion revealed recurrence of the malignant mesothelioma. X-ray disclosed a pulmonary metastasis and no further therapy was instituted. Five months later the patient was readmitted because of increasing respiratory failure due to multiple lung metastases and a right pleural effusion. A cytological examination of the pleural fluid has revealed malignant mesothelioma cells.

Case 3. A 79-year-old man was admitted to the hospital with a firm mass present for one year in his right lower inguinal area. Past medical history revealed a right-sided inguinal herniotomy thirty years ago, and six years prior to actual admission a transvesical resection of the prostate had been performed due to benign hyperplasia. There was no evidence of asbestos exposure. Surgical exploration revealed a femoral hernia, which was resected. The wall of the distal 2 cm of the hernial sac was remarkably thickened with a granulated, brown inner surface. Microscopic examination disclosed a mesothelioma (Figs. 5, 6). All physical and laboratory investigations were normal, and no signs of intra-abdominal tumour were found.

The patient died five years later from a metastasizing, poorly differentiated prostatic cancer, specified immunohistochemically by a positive reaction to prostatic-specific-antigen and acid phosphatase. Control sections of the mesothelioma of the hernial sac showed no reaction for these antigens. An autopsy was not performed.

Methods

In all cases formalin fixed, paraffin embedded sections were stained as follows: Haematoxylin and eosin, periodic acid Schiff

before and after diastase treatment, Gordon and Sweets' method for reticulin, van Gieson-Hansen and Pearl's stain.

Paraffin sections were also stained by a two-step immunoperoxidase method using monoclonal antibodies to epithelial membrane antigen (EMA) and vimentin; and polyclonal antibodies for cytokeratin II, carcinoembryonic antigen (CEA) and Factor VIII related antigen. (All these antibodies from DAKO.) A polyclonal antibody against a specific protein found in mesothelial cells was also used, and the staining was performed according to the method previously described by one of the authors (Donna et al. 1986).

Results

Case 1. The papillary excrescences were attachted to the tunica vaginalis testis by connective tissue pedicles and there was a gradual transition from normal mesothelium to the tumour (Fig. 1). Tubular structures were invading in the pedicles, as well as superficially in the tunica vaginalis (Fig. 2). The infiltration never reached the testicular parenchyma. The cells covering the papillae and forming the tubules were cuboidal to tall columnar with a moderate amount of eosinophilic cytoplasm without mucin. The nuclei were rounded or oval, with single nucleoli. Only slight nuclear pleomorphism and a very low mitotic rate (0 to 1 per 10 HPF ($\times 400$)) were found. No psammona or asbestos bodies were found. The complex architecture and invasive growth pattern originally lead to the diagnosis of a malignant mesothelioma. As the cellular atypia was slight and the mitotic activity low, the tumour was regarded as being of low malignancy. Since it was removed radically, with a distance of 8 cm to the line of resection, no further therapy was instituted. This case has been extensively illustrated in colour in 1985 (Jones et al. 1985).

Case 2. The lining mesothelial cells were mainly arranged in papillary excrescenses and tubules (Fig. 3), but in some areas the proliferating cells formed small sheets. The maximal depth of invasion was 1 mm in both the parietal and visceral layers of the tunica vaginalis testis. Marked nuclear pleomorphism including a few multinucleated cells were seen and the number of mitotic figures were on the average 13 per 10 HPF (Fig. 4). The cytoplasm was abundant and eosinophilic with no mucin. No psammona or asbestos bodies were ob-

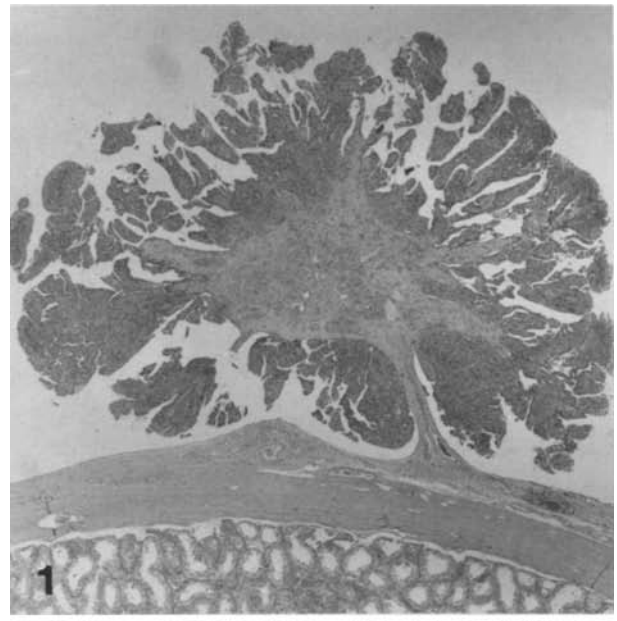


Fig. 1. (Case 1). A papillary tumour attached by a stalk of connective tissue to the visceral tunica vaginalis testis. There is no tumour infiltration in the stalk seen here or in the underlying testicular parenchyma. (H & E × 13.5)

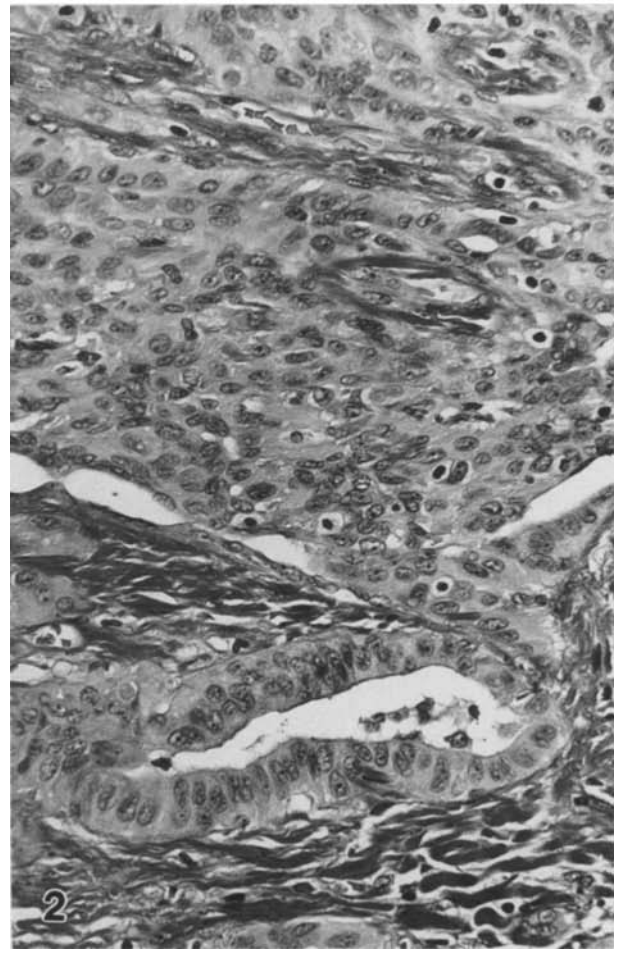


Fig. 2. (Case 1). High power view of a stalk with tumour infiltration. At the bottom a single tubules lined with columnar cells, and at the center sheet of cubic to polyglonal cells are seen. Mild nuclear pleomorphism with some pyknotic nuclei, but no mitoses is seen. (Van Gieson × 320)

served. The tumour was diagnosed as a malignant, papillary mesothelioma of the tunica vaginalis. As only superficial invasive growth was found and the distance to the line of resection was about 6 cm, the patient was considered to have been treated radically.

The histology of the local recurrence and lymph node metastases was similar to that of the originally excised tumour. A higher mitotic activity and an increased degree of anaplasia could be demonstrated however.

Case 3. This specimen showed a gradual transition from normal mesothelial cells to epithelial proliferations forming papillary structures with numerous psammona bodies (Figs. 5, 6). In some areas the tumour was composed of infiltrating tubules and cell nests. The maximal real depth of infiltration was 3 mm in the 5 mm thick wall of the hernial sac. The mesothelial cells were cuboidal to polygonal with weakly eosinophilic, occasionally vacuolated cytoplasm without mucin. The nuclei were enlarged and polymorphic with prominent nucleoli. The mitotic activity was low (0–2 per 10 HPF). In the inner part of the wall the stroma was rather loose and vascularised with scattered lymphocytes, plasma cells and hemosiderin-laden macrophages. Asbestos bodies could not be identified, but some talc crystals were found.

The tumour was diagnosed as a malignant mesothelioma of epithelial type, as the proliferation had a diffuse and infiltrating way of growth and a moderate cellular atypia was evident. The operation was considered radical.

In all three cases the immunohistochemical findings supported the mesothelial nature of the tumour cells, with a positive reaction to the specific mesothelial protein (Donna et al. 1986). Cytokeratin staining was moderately positive in all the tumours. The tumour cells in case 3 showed a strong staining reaction for EMA, while the reactivity was variable and occasionally negative in the tumour cells in case 1 and 2. In case 1 some of the cells were decorated with vimentin, while case 2 and 3 were entirely negative. The staining reactions for CEA and Factor VIII related antigen were negative in all three cases.

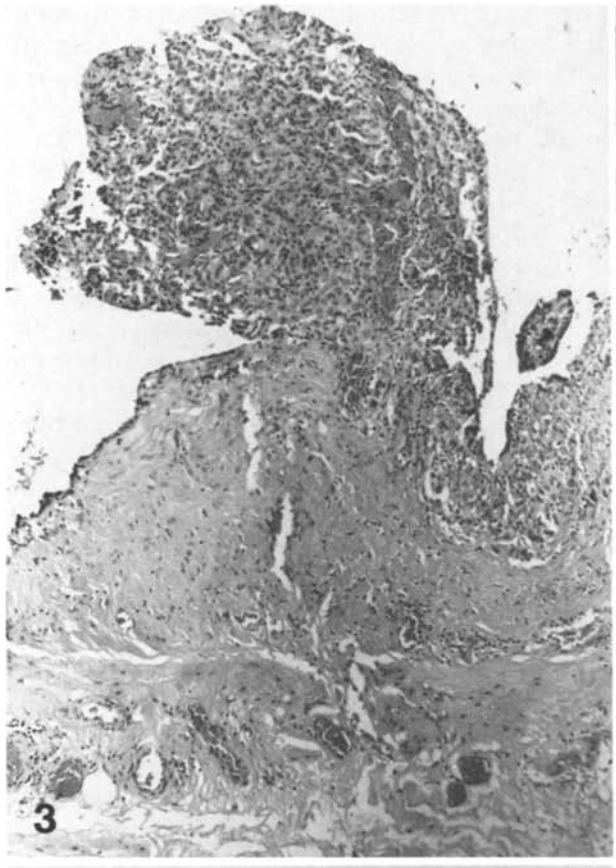
Discussion

Mesotheliomas originating from the tunica vaginalis testis and hernial sacs are rare. The majority of these mesotheliomas are of the epithelial type, and they usually exhibit a papillary pattern with a diffuse growth along the serosal surface (Jones et al. 1985). This raises two diagnostic problems: Are they malignant? If so, the most important differential diagnosis is primary or metastatic intrascrotal adenocarcinoma (Young and Scully 1986), or are they benign reactive proliferation of the mesothelium? The presence of intracellular PAS positive and diastase resistent mucin-globules excludes a mesothelioma (Japko et al. 1982). Reticulin staining shows a varying amount of reticulin fibrils among individual cells in mesotheliomas, a feature that also may help in distinguishing mesothelioma from adenocarcinomas (Enzinger and Weiss 1983).

The mesothelial origin of these tumours may be confirmed by immunoperoxidase procedure using antibodies with a high specificity for mesothelial cells (Donna et al. 1986; Japko et al. 1982). Positive immunological staining against cytokeratin and EMA, combined with negative reactivity against CEA also favor the diagnosis of a mesothelioma (Bolen et al. 1986; Pfaltz et al. 1987; Strickler et al. 1987).

The differentiation between reactive and neoplastic mesothelial proliferation may at times be very difficult. Although the clinical presentation and histological findings may favour one of the diagnoses, a considerable overlap between the two conditions exists (McCaughey and Al-Jabi 1986). The overlap may represent a real event and not just a problem of diagnostic differentiation, as some cases of benign cellular proliferation, through a stage of proliferating atypia, have resulted in a lethal outcome (Riddell et al. 1981).

Grossly visible proliferations are seldom found in benign reactive hyperplasia (McCaughey and Al-Jabi 1986; Rosai and Dehner 1975). Microscopically papillary and tubulo-papillary structures are frequently seen in mesotheliomas, but may also be observed in reactive states (McCaughey and Al-Jabi 1986; Mostofi and Price 1973; Rosai and Dehner 1975). In the latter cases, however, the papillary processes are simple and without the arborescent pattern of fibrous stalks branching into several fine papillary processes, which are typically found in mesotheliomas (Mostofi and Price 1973). Slight cytological atypia may be seen in both types of proliferations, but a marked nuclear atypia with prominent nucleoli give strongest support to the diagnosis of a mesothelioma. True infiltration of adjacent tissue excludes a reactive proliferation; in some cases, however, it may be difficult to differentiate between true invasion and a pseudoinvasion brought about by the incorporation of the proliferating mesothelial cells in a fibrosing process (McCaughey and Al-Jabi 1986). While a focal or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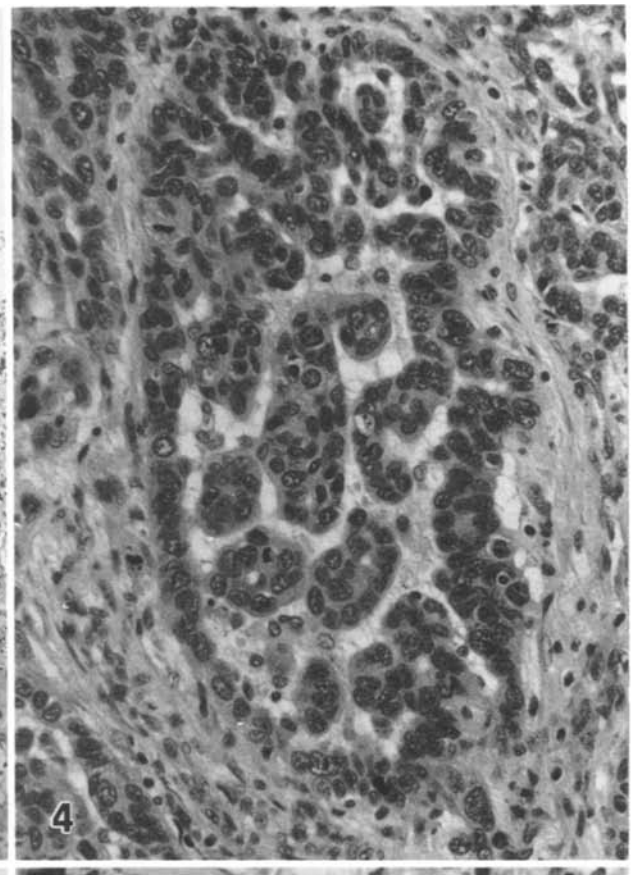
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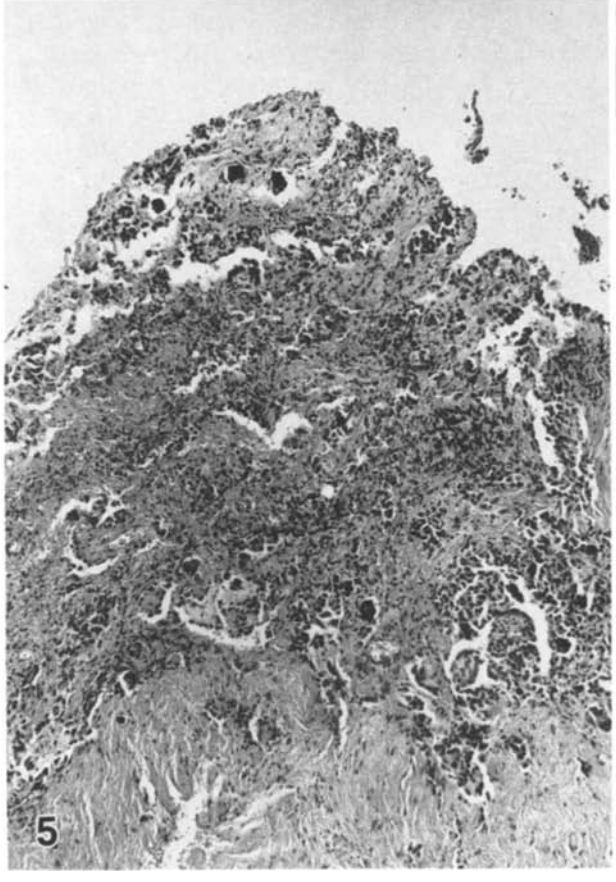
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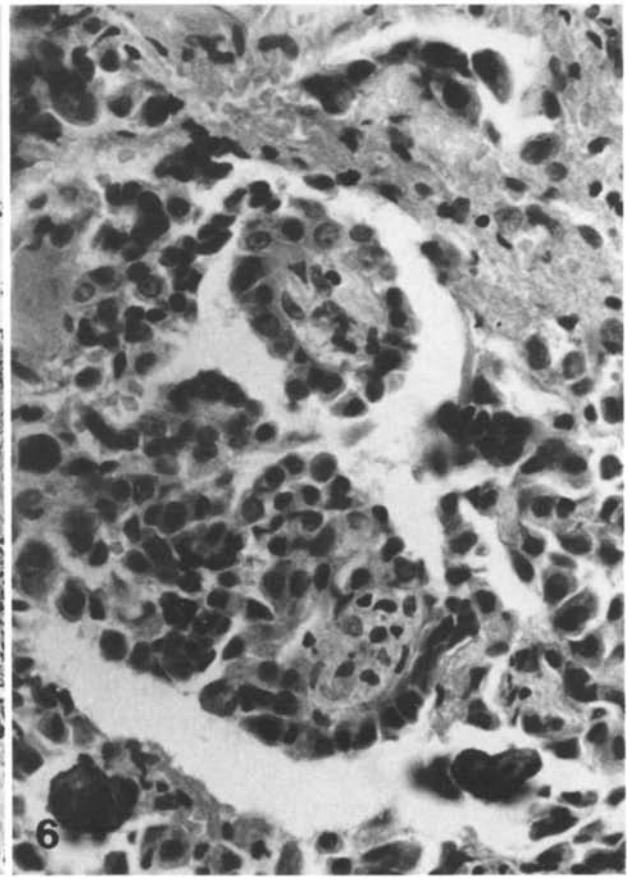
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diffuse lymphocytic infiltration quite often is found in mesotheliomas, as well as in reactive hyperplasia, a striking fibrovascular stromal reaction with extravasation of erytrocytes and deposits of fibrin is said to favour the latter (Rosai and Dehner 1975).

In the present and reviewed cases, the neoplastic character of the processes and the diagnosis of mesotheliomas were mainly indicated by their complex structure and invasive tendency. Ultrastructural studies, which may be valuable in distinguishing malignant mesothelioma from carcinoma, are not specifically useful in the distinction between malignant and benign mesothelium and have not been performed in the present investigation. Neither has morphometry.

Another but somewhat more semantic or terminological problem, is the differentiation of these tumours from the adenomatoid tumour. In males, the latter is typically seen as a solitary, firm, well-demarcated tumour in the epididymis. More rarely the tumours arise in the spermatic cord or testicular tunics, where they may be plaque-like and ill-defined (Talerman and Roth 1986). Although evidence of a mesothelial cell origin of these tumours is now well established (Petersen 1986), we prefer to maintain the term "adenomatoid tumour", emphasing the uniformly benign behavior of this tumour in contrast to the mesotheliomas, which are the topics of the present study.

Review of the literature has revealed 35 well-documented cases of primary mesotheliomas originating from the tunica vaginalis testis (Amthor et al. 1988; Antman et al. 1984; Bailey et al. 1955; Bàrbera and Rubino 1957; Chassaigne and Voglimacci 1956; Chen et al. 1982; Dressler et al. 1988; Ehya 1985; Eimoto and Inoue 1977; Fishelovitch et al. 1975; Fitzmaurice et al. 1987; Fliegel and Kaneko 1976; Galian et al. 1969; Hamvasi et al. 1977; Hollands et al. 1982; Jaffe et al. 1978; Japko et al. 1982; Johnson et al. 1973; Kasdon 1969; Mikuz and Höpfel-Kreiner 1982; Mostofi and Price 1973; Petersen 1986; Poissonnet 1962; Pugh 1976; Reynolds 1958; Stein and Henkes 1986; Vakalikos et al. 1985; Van der Rhee et al. 1983; Yamanishi et al. 1984.) In five cases no follow-up was recorded (Mostofi and Price 1973; Pugh 1976.)

Reported cases without a convincing histological description of tumour origin from the mesothelial lining of the tunica vaginalis testis or hernial sacs have been excluded (Abell and Holtz 1968; Antman et al. 1984; Arlen et al. 1969; Cartwright and Steinman 1987; Dietemann-Molard et al. 1987; Dümont et al. 1963; Foot 1949; Karunaharan 1986; Kossow and McCann 1981; Kozlowski and Zoltowska 1968; Linn et al. 1988; McDonald et al. 1983; Pizzolato and Lamberty 1976; Schou et al. 1984; Söderström and Liedberg 1966; Talerman and Roth 1986; William and Banerjee 1969). Cases with obscure primary tumour origin and/or with concomitant peritoneal or pleural disease at the time of diagnosis are also excluded (Antman et al. No 5. 1984; Schou et al. 1984; Tang et al. 1976).

These reports and our three cases have revealed two groups of patients with a clinically benign or malignant behaviour of the tumours. The pertinent clinical findings in these two groups are summarized in Tables 1 and 2.

Among the 17 patients with the clinically benign tumours, the median time of follow-up was about 21 months. However the follow-up periods ranged widely and was critically low (6 months or less) in several cases. One patient, in the clinically benign group (our case 3) died 5 years after diagnosis without evidence of recurrence. Asbestos exposure has only been described in the case reported by Japko et al. (1982), but the follow-up time here was only 6 months. It is also the first case, where a preoperative diagnosis by cytological examination of the hydrocoele fluid has been obtained.

In 16 patients (Table 2) the tumour displayed a biologically malignant behavior with local recurrence and/or metastatic dissemination. The spread of the mesotheliomas of the tunica vaginalis testis was usually via lymphatics to inguinal and paraaortic lymph nodes. Distant metastases to the lungs or liver were observed in 6 cases (Antman

Fig. 3. (Case 2). A thickened tunica vaginalis testis showing transition from normal mesothelium (*center left*) to an exophytic process of abnormal mesothelial cell-proliferation. Superficial invasion into the tunic is seen at the *center right*. (H & E × 80)

Fig. 4. (Case 2). High power view showing a tubular structure with several intraluminal epithelial processes. Cellular stratification and atypia are evident. Some mitoses are seen. (H & E × 200)

Fig. 5. (Case 3). A thickened hernial wall with tubular-papillary structures in a loose connective tissue. Psammona-bodies of varying size are present. Superficial invasion in the fibrotic wall is seen at the bottom. (H & E × 80)

Fig. 6. (Case 3). High power view of small papillary structures lined by cubic mesothelial cells. Most of the nuclei in this area were rather dark. Two psammona-bodies are seen at the bottom. (H & E × 320)

Table 1. Seventeen mesotheliomas with a clinically benign course

Ref.	Age	Asbestos exposure	Clinical presentation	Gross appearance	Therapy Initial	Therapy Subsequent	Follow-up
Bailey	21	NS[a]	mass for 5 years	size NS irregular, hard mass and multiple modules	orchiectomy partial scrotectomy		alive & well 15 months
Bàrbera	61	NS	mass with hydrocoele for a few months	size NS, multiple papillary tumours on the TVT[b]	orchiectomy		alive & well 12 months
Reynolds	45	NS	mass with hydrocoele for 15 years. Rapid growth the last year	400 ml sac, numerous polypoid growths varying in size from a few millimeters to 1.5 cm	hydrocoelectomy		alive & well 6 monthswell
Chassaigne	60	NS	hydrocoele for some months	abundant sero-sanguinary hydrocoele fluid, two small, polypoid growths	ing.[c] – scrotal orchietomy & ing. lymphadenectomy		alive & well 6 months
Johnson	23	NS	hydrocoele for 1 month	4 cm granular, verrucal-like tumour	scrotal hydrocoelectomy	ing. orchiectomy hemiscrotectomy ing. lymphadenectomy	alive & well 3 months
Pugh	NS	none	hydrocoele	size NS, thickened TVT. with multiple small papillary processes	orchiectomy		alive & well 4 years
Eimoto	35	none	mass for $2^1/_2$ months	$4 \times 4 \times 3.5$ cm hard, ovoid tumour	orchiectomy radiotherapy		alive & well $1^1/_2$ months
Hamvasi	63	NS	hydrocoele for 4 months	$25 \times 15 \times 10$ cm sac, thickened TVT., multiple nodules	ing. orchiectomy		alive & well 4 months
Japko	30	asbestos for 8 years	hydrocoele for3 weeks	size NS, multiple nodules	ing. orchiectomy		alive & well 6 months
Mikuz	18	NS	hydrocoele for some months	20 ml yellow fluid, 3 cm pedunculated, papillary tumour	tumour excisioned and resection of 8×4 cm of the TVT		alive & well 17 months
Yamanishi	34	NS	mass for 1 year	18 ml bloody fluid, multifocal 1–2 mm processes on the TVT	ing. orchiectomy	radiotherapy on para-aortic and iliacal lymph nodes	alive & well 6 months
Valikos	26	NS	swelling for $1^1/_2$ year	$8 \times 4 \times 2$ cm large tumour	resection of tumour	radiotherapy on inguinal region	alive & well 6 months
Fitzmaurice	72	NS	hydrocoele for 1 week	size NS, several small yellow nodules	ing. orchiectomy hemiscrotectomy		alive & well 18 months
Stein	7	NS	hydrocoele for 15 months	large hydrocoele Pedunculated tumour – size NS	ing. orchiectomy		alive & well 7 months
Amthor	45	none	hydrocoele for 4 weeks	180 ml sac thickened TVT	orchiectomy & iliague lymphadenectomy		alive & well 23 months
case 1	58	none	hydrocoele for 5 years	250 ml hydrocoele sac thickened TVT with several 2–6 mm excrescences	ing. orchiectomy		alive & well 9 years
case 3	79	none	mass for 1 year	A hernial sac with a 5 mm thick wall in distal 2 cm	herniotomy		dead – 5 years later, no evidence of recurrence

[a] NS = not specified; [b] TVT = tunica vaginalis testis; [c] ing. = inguinal

Table 2. Sixteen mesotheliomas with a clinical malignant course

Ref.	Age	Asbestos exposure	Clinical presentation	Gross appearance	Therapy Initial	Therapy Subsequent	Follow-up
Boissonet	71	NS[a]	mass	6 cm hard mass	ing.[b] orchiectomy	RT[c] on inguinal & paraaortic LN[d]	dead – 2 years with MET[e] No autopsy
Galian	73	NS	hydrocoele for 4 years	walnut-size hematocoele thickened TVT[f]	tumour resection	hemiscrotectomy RT on iliaque & paraaortic LN	alive – 1 year
Lasdon	72	none	hydrocoele for 2 years	size NS, large sac with bloody fluid	hydrocoelectomy	orchiectomy, retro-peritoneal lymphadenectomy	alive – 3 years
Lasdon	58	none	hydrocoele for 2 years	size NS, thickened TVT, multiple polypoid growths 0.2–3 cm	orchiectomy & partial scrotectomy	RT	dead – 3 years. extensive skin & soft tissue recurrence. No autopsy
Fishelovitch	60	NS	hydrocoele for 1 year	hydrocoele sac 7 × 4 cm, thickened TVT with solid and papillary structures	orchiectomy	RT on inguinal, paraaortic, mediastinal & supraclavicular LN	alive & well 1 year
Fligiel	68	asbestos for 40 years	hydrocoele for 5 months	hydrocoele sac 8 cm multiple nodules up to 1 cm	orchiectomy		dead – 21 months with METs No autopsy
Pugh	NS	none	hydrocoele	size NS, thickened TVT with multiple small papillary processes	NS		alive – 7 years with LR[g]
Saffe	77	none	scrotal swelling for 6 weeks	hematocoele, multiple papillary excrescences up to 2 cm	orchiectomy	resection of LR RT and chemo-therapy	dead – 1 year Autopsy – widespread METs
Shen	64	NS	hydrocoele for 1 year	hydrocoele sac 8 × 16 cm, multiple small nodules	hydrocoelectomy ing. orchiectomy	chemotherapy for metastatic disease	dead 2 1/2 years with METs. No autopsy
Hollands	63	NS	hydrocoele	size NS	hydrocoelectomy	orchiectomy for LR. Hemisrotectomy for LR	alive & well 2 years
Van Der Rhee	86	none	hematoscrotum	blood-filled cavity 6.5 × 4 × 3 cm, multiple papillary structures	hemiscrotectomy	resection of LR	dead – 3 years, cachetic with extensive LR No autopsy
Antman	58	asbestos	hydrocoele	multiple nodules, the largest 1.5cm	ing. orchiectomy	chemotherapy	alive – 6 years with METs
Ghya	63	NS	hydrocoele for 3 years	250 ml hydrocoele fluid, multiple papillary projections up to 0.3 cm	hydrocoelectomy through scrotal incision	wide resection of LR chemotherapy	dead – 4 years with METs No autopsy
Petersen	51	NS	NS	NS	surgery – NS	resection of LR twice	alive – 2 1/2 years
Dressler	76	NS	hydrocoele for 12 years	hydrocoele with bloody fluid, thickened nodular TVT	hydrocoelectomy ing. orchiectomy & hemiscrotectomy	resection of LR & prophylactic RT on regional LN region	dead – 1 year with METs No autopsy
Case 2	66	asebestos for 10 years	hydrocoele for 2 years	hydrocoele fluid 200 ml, thickened TVT with multiple papillary 2–3 mm large excresenses	ing. orchiectomy	resection of LR & metastatic inguinal & retroperitoneal LN	alive – 3 1/2 years with LR and METs

NS = not specified; [b] Ing. = inguinal; [c] RT = radiotherapy; [d] LN = lymph nodes; [e] MET = metastases; [f] TVT = tunica vaginalis testis; LR = local recurrence

et al. 1984; Chen et al. 1982; Ehya 1985; Dressler et al. 1988; Jaffe et al. 1978 case 2). Follow up periods ranged from 1 to 7 years with a median of 2, 8 years and 8 patients died within 1 to 4 years of diagnosis, metastases being found in 6. In the other two patients, only local recurrence was clinically manifest, however, one of the patients died in a cachectic state. Unfortunately no autopsy was performed in either case.

Asbestos exposure has been described in one of the 17 patients in the clinically benign group (Japko et al. 1982), and in 3 of the patients with malignant running tumours (Antman et al. 1984; Fliegel and Kaneko 1976, our case 2). Unfortunately an occupational history has not been emphasized in all the cases. Interestingly, too, prior trauma or herniotomy were recorded in 5 of the 17 patients in the clinically benign group (Fitzmaurice et al. 1987; Hamvasi et al. 1977; Johnson et al. 1973; Mikuz and Höpfel-Kreiner 1982, our case 3), and in the latter case talc crystals were demonstrated. Radiation, which has also been suggested a causative agent for mesothelioma was not recorded in any of the clinical reports. Asbestos bodies could not be identified in any of the cases, where special examination has been performed (Fliegel and Kaneko 1976; Japko et al. 1982; Kasdon 1969, cases 1–3).

In our combined material the histology revealed 3 tumours of mixed type (Amthor et al. 1988; Chen et al. 1982; Hamvasi et al. 1977), one of connective tissue type (Eimoto and Inoue 1977), one without specification of the type (Hollands et al. 1982), and the remaining 28 tumours of epithelial type. Like the diffuse malignant mesotheliomas in the larger cavities the invasive growth of the tumours in both groups was rather shallow, and in four of the tumours with biologically benign behavior no convincing signs of invasion were observed (Bàrbera and Rubino 1957; Chassaigne and Voglimacci 1956; Mikuz and Höpfel-Kreiner 1982; Reynolds 1958). Although lack of tumour-invasion seems to indicate a favourable prognosis, this is not an exclusive finding, as emphasized in the lethal case described by Ehya (1985). Superficial infiltration into the adjacent tissue of the testis, epididymis or spermatic cord was noted in 3 benign and 5 malignant cases respectively (Bailey et al. 1955; Eimoto and Inoue 1977; Stein and Henkes 1986; Chen et al. 1982; Fliegel and Kaneko 1976; Galian et al. 1969; Hollands et al. 1982; Kasdon 1969). Vascular invasion was reported in 3 patients in each group (Dressler et al. 1981; Eimo and Inoue 1977; Fliegel and Kaneko 1976; Japko et al. 1982; Kasdon 1969; Yamanishi et al. 1984).

Although a clinical presentation with an unilateral hydrocoele, occasionally associated with a mass, was a characteristic finding in both groups, the presence of bloody fluid was almost exclusively associated with the clinically malignant tumours. Tumour necrosis was found exclusively in the malignant cases (Galian et al. 1969; Jaffe et al. 1978; Poissonnet 1962; Van Der Rhee et al. 1983). As to the microscopic growth pattern, a papillary pattern dominated among the tumours with a benign behavior. A tubulo-papillary pattern was present in some cases, while the occurrence of solid epithelial nests were noticed only in 2 cases (Stein and Henkes 1986, case 3). The majority of clinically malignant tumours revealed a more variegated growth-pattern consisting of tubulo-papillary structures and often solid sheets. Psammona bodies or irregular calcified structures (Jones et al. 1985) were found in both groups (Chen et al. 1982; Ehya 1985; Johnson et al. 1973; Japko et al. 1982; Petersen 1986, case 3).

Comparison of the cytological features of the tumours, especially in regards to epithelial mesotheliomas has revealed a striking difference between the two groups. However it is not without exceptions. The majority of benign running – low grade tumours showed mild cellular atypia and no or only a few mitoses, with only two exceptions (Fitzmaurice et al. 1987; Japko et al. 1982). In contrast, the high-grade tumours showed great cellular and nuclear pleomorphism, a high mitotic rate with abnormal mitotic figures, but with two exceptions (Ehya 1985; Galian et al. 1969). While even histologically low-grade tumours may recur if not completely excised (Johnson et al. 1973), the high-grade tumours also have the capacity to metastasize. Inadequate surgery, including partial scrotectomy and low resection of the spermatic cord probably accounts for the local recurrences occurring in two cases (Kasdon 1969; Van Der Rhee et al. 1983).

In conclusion, the analysis of 33 mesotheliomas of the tunica vaginalis testis and hernial sacs has revealed some correlations between histology and clinical course. Since the behavior is not safely predictable the tumour should always be considered of at least borderline malignancy, and the term "benign papillary mesotheliomas" used by some authors (Petersen 1986) should be discarded by pathologists, as it may lead clinicians to inappropriate therapy and follow up.

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