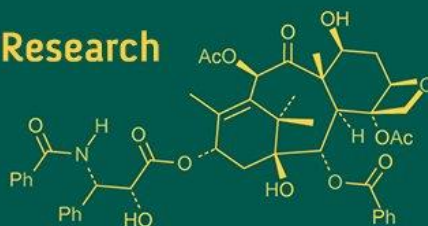


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Therapeutic and surgical management of canine tumours

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Abstract

A study was carried out on 25 clinical cases of canine tumours for a period of six months at Small Animal Surgery unit, Veterinary Clinical Complex, Rajiv Gandhi Institute of Veterinary Education and Research Puducherry. Tumours of all origin were considered irrespective of age, sex and breed. All the cases underwent physical, clinical and haematobiochemical examination. Radiography, electrocardiogram and fine needle aspiration cytology were studied. Preoperatively, all the dogs were administered with oral tablet Nigmin @ 1 tab/ 10 kg b.wt for a period of six months. All the tumours were surgically excised and sent for histopathology examination. The breed most commonly affected were non-descript (28%) followed by Labrador retriever (20%), Spitz (16%), Pug (12%), Golden Retriever (8%), Dachshund (8%), Kanni (4%) and Chippiparai (4%) with the age group ranging from 3-12 years. Among gender, females were most affected (64%) compared to male (36%). Postoperatively, all the dogs were administered with oral tab. cefpodoxime @ 10mg/kg b.wt and tab tramadol @ 2mg/kg b.wt for seven and two days, respectively. Wound dressing was done on every three days once and sutures were removed on 10th postoperative day.

Keywords: Canine tumours, Histopathology, Surgical excision, Nigmin

Introduction

Canine tumours have increased its prevalence among companion animals in a recent year's and this may be due to advances in both human and veterinary medicine that makes pets, like human beings to live longer (Lana *et al.*, 2007) ^[1].

These tumours can be benign or malignant and may arise from various cell types present in the skin and can affect dogs of all ages, breeds and sizes. The high incidence of development of tumours in skin could be due to continuous exposure of skin to various physical, chemical and other environmental factors (Subapriya *et al.*, 2021) ^[5]. This may also be due to early detection of these cutaneous lesions.

Herbal anti-cancer drugs offer therapeutic advantages, particularly selective toxicity against cancer cells, reducing the adverse side effects associated with conventional chemotherapy. Recent studies and clinical trials highlight the benefits of herbal medicines in alleviating side effects, improving tolerance to chemotherapy and the occurrence of synergistic effects with conventional treatments (Giordano and Tommonaro, 2019) ^[13].

Hedlund, 2007 reported that the prognostic factor for post surgery survivability to treat malignant tumour are clinical signs, tumour size, anatomic location and ovariohysterectomy status. Furthermore, these tumors invade through the lymphatic and blood vessel routes to the regional lymph nodes and lungs. Therefore, the accurate and early diagnosis of lung metastases is of considerable importance in the establishment of therapeutic measures. The most frequently used imaging techniques are radiographic examinations, magnetic resonance and computerized tomography (CT) for identification of lung metastases.

Since most of the cases were presented at the chronic stage during the time of physical examination, the present study was carried out with the objective to identify the spontaneously occurring tumours in dogs based on gross, radiographic findings, cytological, histopathological changes and to study the influence of breed, sex, age and location on the occurrence of various skin tumours.

Materials and Methods

The study was conducted on 25 clinical cases of canine tumours for a period of six months irrespective of age, sex and breed presented at Small Animal Surgery unit, Veterinary Clinical Complex, Rajiv Gandhi Institute of Veterinary Education and Research Puducherry. Animal particulars, location, size, shape, colour, margins, orientation, extent of the tumour, consistency and duration of the tumours were presented in the Table 1. Physiological parameters such as heart rate, respiration rate and rectal temperature (°F) were recorded. Haemato-biochemical parameters were performed before and after surgery in all dogs. Pre-operatively all the animals were subjected to fine needle aspiration cytology, thoracic radiograph of lateral and dorso-ventral view for metastasis of lungs and electrocardiogram to rule out cardiac involvement.

Preoperatively, all the dogs were administered with oral tablet Nigmin (Nigella sativa-450 mg, Curcuma longa-150mg, Grape seed extract-75mg, Piper longum- 30 mg, Berberis aristata- 90 mg, Cinnamomum zeylanicum- 60 mg) @ 1 tab/ 10 kg b.wt as a herbal anti-cancerous supplement. Animals with severe pulmonary metastasis were excluded from the study (Figure 1).

All the animals were premedicated with inj. Butorphanol @ 0.2 mg/kg body weight and inj. Diazepam @ 0.3mg/kg body weight intravenously, respectively. Pre oxygenation with 100% oxygen for ten minutes before anaesthesia followed by induction with Inj. Propofol @ 4 mg/kg body weight intravenously and maintained under 3% Isoflurane anaesthesia. All the tumours were surgically excised and mammary tumour was excised wide margins along with lymph nodes

Mammary tumour (n=14)

Regional mastectomy was performed in cases where two or more mammary glands involved as a unit with sentinel lymph node and the tumour mass was completely excised along with the tumour capsule without leaving any tumour tissue behind and reconstructed with flank fold flap. Out of 9 cases, 4 animals had local recurrence of tumour indicating malignancy.

Unilateral mastectomy was performed in cases where the entire chain of mammary glands was excised with wide margins along with lymph nodes and followed by excision of tumour mass was reconstructed with flank fold flap that particular side (either right or left) and sutured. Out of 5 cases, two animal developed limb edema and suture dehiscence (Figure 2).

Digital tumours (n=5)

Digit amputation was performed on the digits of forelimb and hindlimb. All animal recovered uneventfully with no recurrence noticed on observation till one year (Figure 3).

Oral tumour (n=2)

Full thickness labial advancement flap was performed in a dog presented with a mass on the left upper and recurrence was noticed after 3 months of surgery indicating malignancy.

Bilateral rostral hemimaxillectomy was performed in a dog presented with a mass located on premaxilla with the invasion of incisors and canine tooth and the animal returned to normal prehension after two weeks of surgery and no postoperative complication was noticed. No

recurrence was observed after 5 months of surgery (Figure 4).

Tail tumour (n=2)

Tail amputation was performed in dog presented with mass on the mid-tail (Figure 5).

Ocular tumour (n=1)

Trans-palpebral enucleation was performed in a dog presented with mass on the conjunctiva extending to cornea and sclera. This technique involves removal of the entire globe and all of the attaching conjunctiva, third eyelid and extraocular muscles, along with the lid margins and permanent tarshorrhaphy was performed and bandaged. No recurrence was observed till 6months of follow up (Figure 6).

Temporal tumour (n=1)

Mass presented on the temporal region was solid, non-ulcerated, movable and the mass was surgically excised (Figure 7).

Histopathological examination

Based on the location and size of the oral tumour different surgical procedures were opted to resect the mass completely and the mass was subjected for histopathological examination. All the samples were sectioned and stained using haematoxylin and eosin stain.

Histopathological findings of all the tumour samples were Adenocarcinoma (n=4), Fibromyxoma (n=3), Cystadenoma (n=1), Lipoma (n=2), Mastocytoma (n=1), Trichoblastoma (n=1), Plasmocytoma (n=1), Mixed mammary tumour (n=2), Liposarcoma (n=3), Papillary adenocarcinoma (n=2), Hepatoid gland adenocarcinoma (n=1), Fibrosarcoma (n=1), Squamous cell carcinoma (n=1), Basal cell carcinoma (n=1) and Malignant melanoma (n=1) are shown in Figure 8-22.

Postoperatively, all the dogs were administered with oral tab. cefpodoxime @ 10mg/kg b.wt and tab tramadol @ 2mg/kg b.wt for seven and two days, respectively. Wound dressing was done on every three days once and sutures were removed on 10th postoperative day. The data obtained in the study were statistically analysed.

Results and Discussion

Skin is an extensive organ, which is exposed directly and indirectly to various carcinogens from the environment and has a considerable population of cells in growth for continuous renewal and thus has more possibilities to develop mutations (Goldschmidt and Hendrick, 2002) [2]. Percentage of breeds affected with skin tumours were non-descript (n=8, 28%) followed by Labrador retriever (n=4, 20%), Spitz (n=4, 16%), Pug (n=3, 12%), Golden Retriever (n=2, 8%), Dachshund (n=2, 8%), Kanni (n=1, 4%) and Chippiparai (n=1, 4%). The findings correlate with Kujur (2005) with the highest incidence of skin tumours in non-descript dogs followed by purebreds. Increase in the occurrence of cutaneous tumours in Labrador retriever and Spitz among the purebreds might be due to the preference of this breed by the pet owners (Subapriya *et al.*, 2021) [5].

Age of the animals were ranging from 0-1 years (n=0), 1-3 years (n=1, 4%) 3-6 years (n=5, 20%), 6-9 years (n=10, 40%), 9-12 years (n=9, 36%) with the mean age of 7.24 years. The age group of the dogs presented with skin tumours had a wide range of 1.5 years to 12 years with the

mean age of 7.24 years however; Hasiri *et al.* (2019) [6] have recorded the mean age of 8.22 years in their study on skin tumours in dogs.

Sex-wise occurrence with skin tumours recorded predominantly in females than in males with the percentage of females (n=18, 72%) and male (n=7, 28%). Similar observations have been reported by Arya *et al.* (2018) [7] who stated that female dogs have higher chance of developing tumour than male dogs as sex difference in the metabolism and detoxification of carcinogens, hormonal interaction with receptors in neoplastic tissues.

Location of tumours were mostly on mammary glands affecting unilateral or bilateral pairs (n=14) followed by digital tumours (n=5), oral tumours (n=2), temporal (n=1), tail tumour (n=2) and conjunctival tumour (n=1). Mukatirwa *et al.* (2005) [8] stated that location of skin tumours was mostly on the trunk with 46.1 percent and 24.3 percent in the limbs, 22 percent of the neoplasms on the head and neck. This could be due to exposure of this vast area to the environmental carcinogens including prolonged solar exposure.

Jemal *et al.* (2002) [4] reported that together with mammary cancers, cancers of the skin comprise 58% of the total cancers occurring in the dog, and thus, account for the majority of canine cancer. In the present study, reports of mammary tumour (56%) were higher compared to other skin tumours. Histopathological results of mammary tumour were liposarcoma, mixed mammary tumour, adenocarcinoma, papillary adenocarcinoma, hepatoid gland carcinoma, fibromyxoma and lipoma.

Tumour occurred in the digits was more in forelimbs (n=3) than hindlimb (n=2) and the histopathology revealed fibromyxoma, cystadenoma, mastocytoma and squamous cell carcinoma this correlated with the findings of Carolyn *et al.*, 2005 [12] were author states that the occurrence of digital tumours was more on forelimb than hindlimb with higher percentage of malignant than benign tumours; however in the present study 80% of benign and 20% of malignant tumours was reported.

The oral cavity which contains a mixture of cell types is the fourth most common location affected by tumours in dogs (Ghirelli *et al.*, 2013) [10]. In the study, the mass was located on premaxilla and upper lip and the histopathology revealed basal cell carcinoma and fibrosarcoma, respectively.

Tail tumour observed in our study was fibrosarcoma and fibromyxoma. The tumour was located on mid-tail with ulceration and tail amputation was performed on both the cases. Shameem *et al.*, 2022 reported Fibrosarcoma occurrence in the base of the tail; however in our study it was in the mid-tail region. Fibromyxoma is a rare benign connective tissue tumour of fibroblast and has abundant mixed collagenous and myxomatous stroma (Goldschmidt and Hendrick 2002) [2], but reports of fibromyxomas are rare in limbs, tail and abdomen.

Malignant melanoma in dogs is a serious and aggressive cancer, most commonly developing in the mouth but also appearing on the skin, toes, or nail beds. Malignant melanoma accounts for 70% of all melanin-producing tumors and 7% of all malignant tumors (Smith *et al.*, 2002) [11]. In our study, it was located on the conjunctiva extending to cornea and sclera. Enucleation was performed and animal recovered uneventfully with no recurrence after surgery.

Trichoblastoma is one of the cutaneous tumour develops from hair germ cells which are solitary dome-shaped to polypoid in nature mostly located on the head and neck region (Haydardedeoglu *et al.*, 2015) [9]. In our study it was located on the temporal region of a dog which was solid round shaped, non-ulcerated and the mass was surgically excised.

All the cases were given tab Nigmin as herbal anti-cancerous supplement on the day of presentation. Results revealed animals with benign tumour had decrease in the tumour size and recurrence rate was reduced, however with malignant tumour not much of difference were noticed. The inflammatory process induces an increased production of pro-inflammatory molecules such as cytokines, ROS, cyclooxygenase (COX-2), transcription factors including nuclear factor κ B (NF- κ B), protein kinases B (AKT), activator protein 1 (AP1), signal transducer and activator of transcription 3 (STAT3), causing the initiation and development of cancer and herbal supplement with Curcumin as an ingredient exerts its immunomodulatory ability by interacting with several immune mediators aids its anticancer property (Mohamed *et al.*, 2017) [14].

Of 25 tumour cases, 28% of animal did not survive due to severe pulmonary metastasis and recurrence or increase in the tumour size. The most common surgical complications noticed were suture dehiscence in two cases, seroma in three cases, posterior limb edema in two cases, local recurrence at the tumour site in four cases and delayed wound healing in three cases.

To conclude the prospective study highlighted the occurrence and clinico-pathological features of canine tumours in dogs and Nigmin as herbal anti-cancerous supplement aids in decreasing the growth of tumour.

Conflict of Interest

Authors have no conflict of interest in this study.

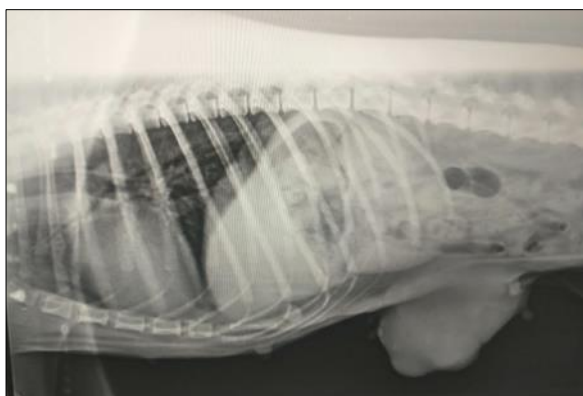
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Table 1: Animal particulars, Duration and Anatomic location of the tumours

Case No	Breed	Age (yrs)	Gender	Anatomic location	Duration (months)
1.	Non Descript	7 yrs	Male	Right Forepaw	3months
2.	Kanni	6 yrs	Female	Right Elbow	2months
3.	Labrador	4 yrs	Male	Cranio-ventral abdomen	3months
4.	Non Descript	10 yrs	Female	Mammary Gland	6months
5.	Chippiparai	7 yrs	Male	Wart all over the body	12months
6.	Golden Retriever	8 yrs	Female	Left 2nd Metatarsal	2months
7.	Dachshund	3.5 yrs	Female	Left Lateral Abdomen	4months

8.	Labrador	3 yrs	Male	Left Abdomen	4months
9.	Labrador	4 yrs	Male	Mid-tail	3.5months
10.	Sptiz	6 yrs	Female	Temporal	8months
11.	Pug	7 yrs	Female	Around Anal Mucosa	6months
12.	Non Descript	11 yrs	Female	Mammary Gland	6months
13.	Non Descript	9 yrs	Female	Mammary Gland	5months
14.	Dachshund	9 yrs	Female	Mammary Gland	13months
15.	Labrador	7 yrs	Female	Mammary Gland	3months
16.	Pug	7 yrs	Female	Upper Lip	5months
17.	Sptiz	9 yrs	Male	Right Metatarsal	2months
18.	Non Descript	12 yrs	Female	Prepuce	12months
19.	Golden Retriever	1.5 yrs	Female	Left Stifle	3months
20.	Non Descript	5 yrs	Female	Right hindpaw	2months
21.	Sptiz	7 yrs	Female	Nasal Region	5months
22.	Non Descript	7 yrs	Female	Mammary Gland	3months
23.	Sptiz	12 yrs	Female	Mammary Gland	2months
24.	Pug	9 yrs	Male	Premaxilla	6months
25.	Labrador Retriever	10 yrs	Male	Right Eye	12months



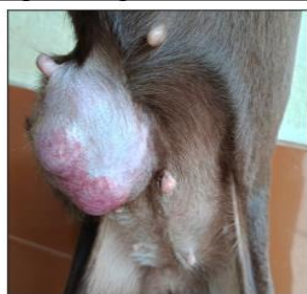
Radiograph of a dog with mammary tumour



Radiograph of a dog with lung metastases.

Fig 1: Lateral thoracic radiography of a dog.

Tumour growth on bilateral caudal mammary glands

Tumour growth on the 3rd and 4th right mammary glands

Tumour growth on left caudal mammary glands



Ulcerated tumour growth on left cranial mammary glands

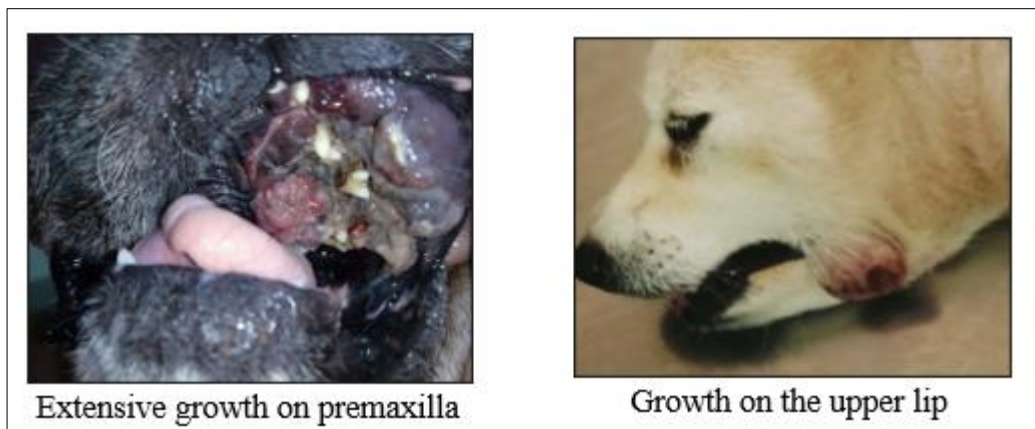
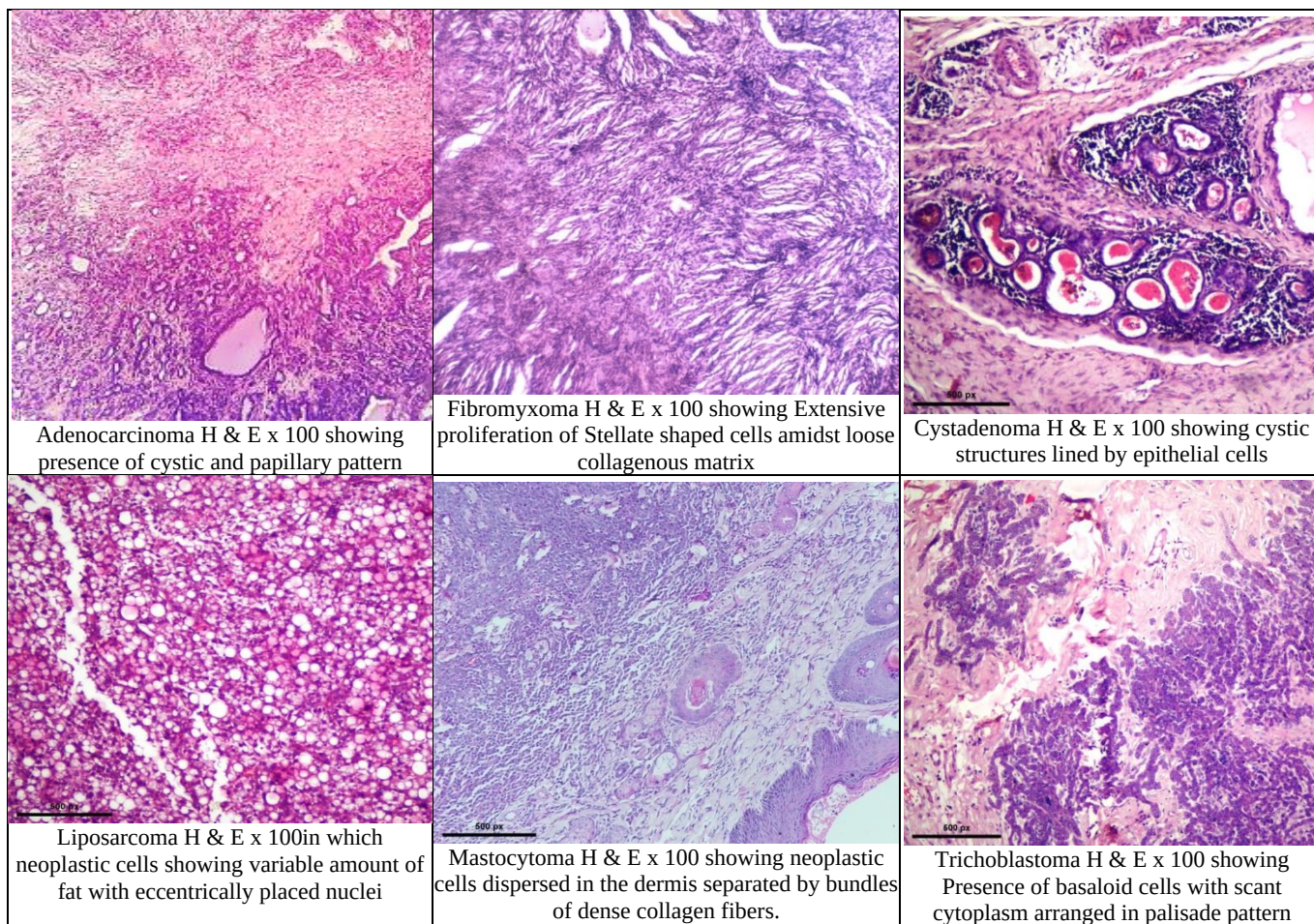
Fig 2: Mammary tumours involving different glands

Ulcerated tumour growth on right metacarpal



Tumour growth on left metacarpal

Tumour growth on left 2nd digitUlcerated tumour growth on left 1st and 2nd digits**Fig 3:** Digital tumours

**Figure 4:** Oral tumours**Figure 5:** Tail tumour**Fig 6:** Ocular tumour**Fig 7:** Temporal tumour

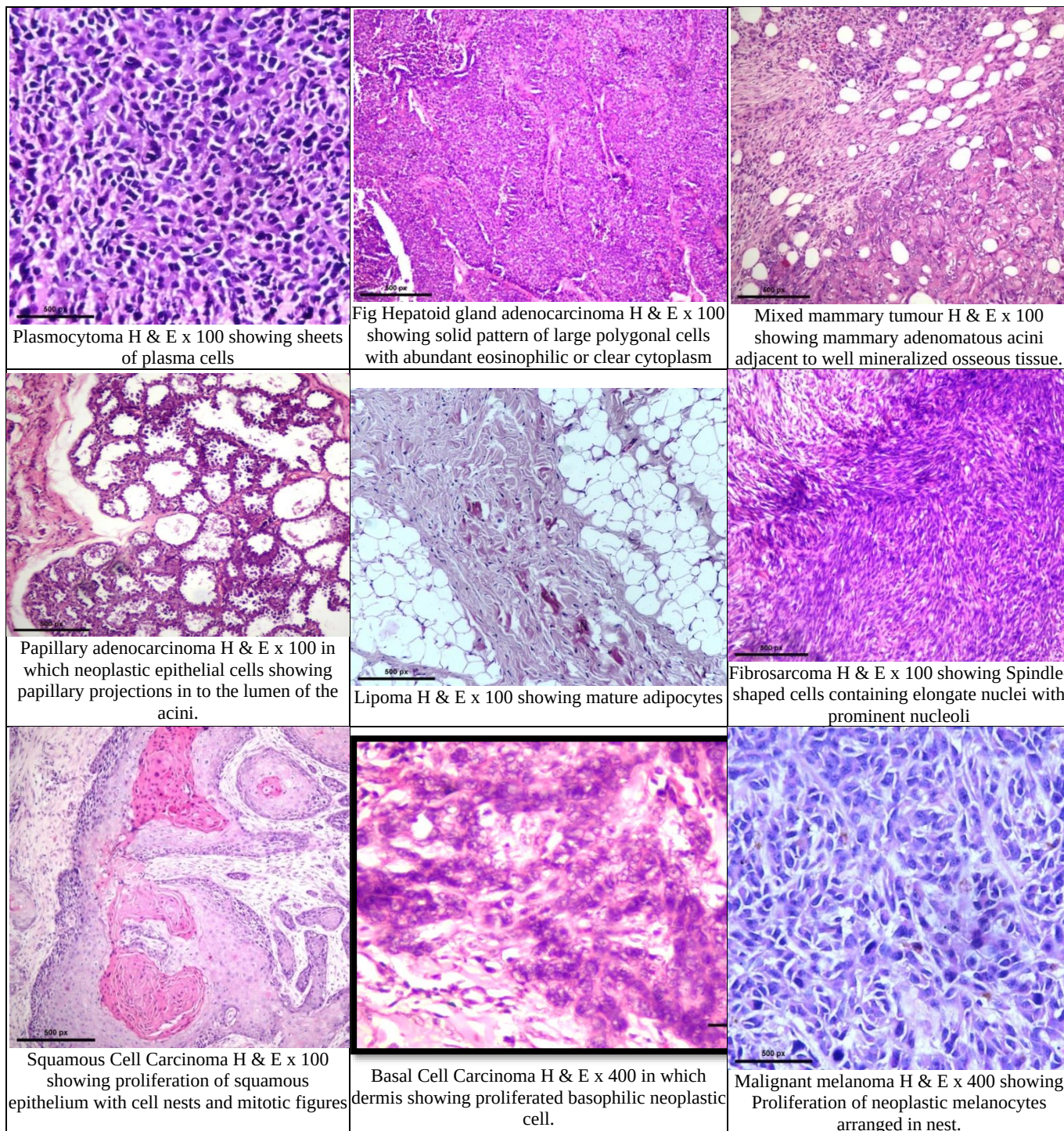


Fig 8-22: Histopathology findings of various tumours

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