EVALUATION OF PENETRATION DEPTH FOR ULTRASOUND GUIDED TISSUE CORE BIOPSY AND FINE NEEDLE ASPIRATION CYTOLOGY

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The study was conducted in 24 dogs to evaluate the efficacy of ultrasound guided tissue core biopsy and fine needle aspiration cytology. Ultrasound examination was performed in all the animals, before biopsy, to evaluate depth of the organ, depth of lesion inside the organ and presence of overlying vessels and structures. Tissue and fluid samples were subjected to cytological and histopathological examination. Due importance was given for depth of penetration in order to collect quality samples and to avoid unnecessary damage to visceral organs.
Key words: Biopsy, penetration depth, sample, ultrasound.

Introduction

Percutaneous biopsy is an important diagnostic procedure in modern medicine. One of the most common indication for abdominal biopsy is the need to obtain a tissue for diagnosis in patients with focal or diffuse lesions (Choi *et al*., 2008). Use of blind biopsy increases the frequency of repeating the procedure to obtain adequate sample for histopathology and may result in formation of large haematoma requiring surgical intervention or transfusion (Maya *et al.,* 2007). Ultrasound guided fine needle aspiration involves the use of a small gauge (18-20) spinal needle placed in the area of interest and subsequent aspiration of cells into the needle. Larger core needles (18-14 gauge) are used for tissue core biopsy (Fossum *et al.,* 2013). Depth of penetration is an important key factor which should be estimated precisely. Excessive penetration may lead to severe trauma to visceral organs. On the other hand, improper depth of penetration may fail to provide appropriate sample for diagnosis.

Materials and methods

Present study was conducted on 24 clinical cases of dogs irrespective of age, sex and breed brought to Teaching Veterinary Clinical Complex, Jabalpur from October, 2013 to March, 2014, for ultrasound examination. On the basis of clinical, haemato-biochemical and ultrasound examination, dogs were divided into five groups (Table 1). Details of lesions in form of depth of organ containing the lesion, depth of the lesion inside the organ and presence of overlying blood vessels were collected during ultrasound examination. Depth of the penetration up to the lesion was evaluated at different angles and the final path of the biopsy needle was decided by selecting minimum depth of penetration from skin surface. Tissue core biopsies were collected using spring loaded automatic tissue core biopsy gun 16G; 16 cm needle having a sample notch of 1.2 cm. For aspiration purpose 18G, 15cm spinal needle was used. Biopsies were collected under sedation and infiltration of lignocaine hydrochloride. Samples were subjected for cytological and histopathological examination.

Results and Discussion

In group 1 four animals with hepatic affections were included in which mean depth of penetration was calculated as 39.32 ± 5.49 mm from skin surface. In three animals penetration depth was estimated correctly and sufficient sample suitable for diagnosis was

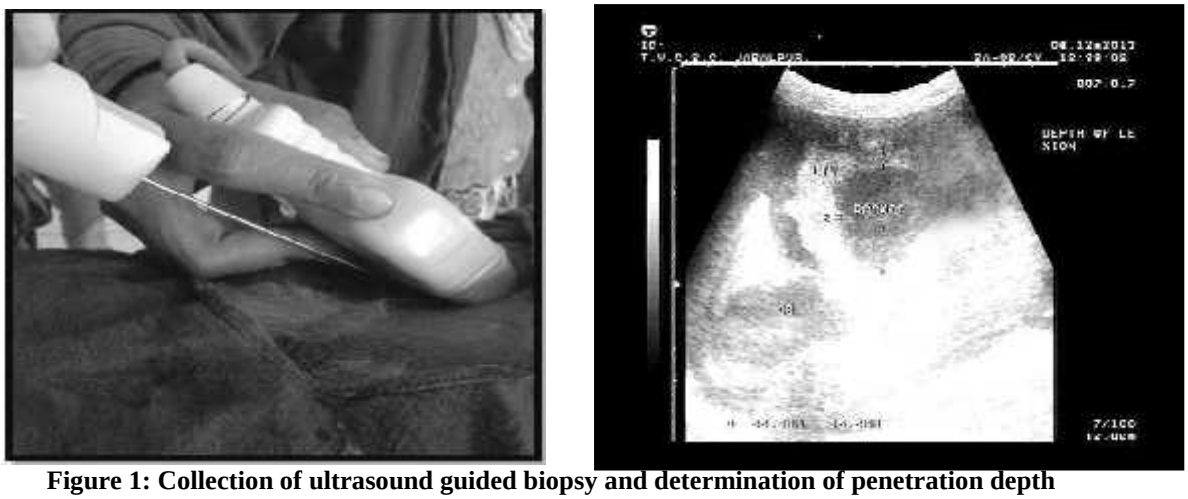

Figure 1: Collection of ultrasound guided biopsy and determination of penetration depth

Table 1: Penetration depth of biopsy needle, post biopsy haemorrhage, crush artifacts and diagnosis in clinical cases

Case No.	Penetration depth from skin surface(mm)	Post biopsy haemorrhage	Crush artifacts	Diagnosis
Group 1: Liver affections				
1.1	55.4	Absent	Absent	Hepatic cyst
1.2	36.5	Absent	Absent	Hepatocellular carcinoma
1.3	30.6	Absent	Absent	Only capsular tissue was approached
1.4	34.8	Absent	Absent	Hepatitis
Mean (± SE)	**39.32 ± 5.49**			
Group 2: Kidney affections				
2.1	22.8	Absent	Absent	No abnormality
2.2	27.5	Absent	Absent	No abnormality
2.3	31.2	Present	Absent	No abnormality
2.4	24.3	Absent	Absent	Tubulo-Interstitial nephritis
2.5	28.4	Absent	Absent	Glomerulonephritis
Mean (± SE)	**26.84 ± 1.49**			
Group 3: Splenic affections				
3.1	18.6	Absent	Absent	No abnormality
3.2	16.4	Absent	Present	Not fit for histopathology
3.3	20.1	Absent	Present	Not fit for histopathology
3.4	13.5	Absent	Absent	Splenitis
3.5	20.2	Absent	Absent	Splenitis
Mean (± SE)	**17.76 ± 1.26**			
Group 4: Peritoneal fluid accumulations				
4.1	28.2	Absent	Absent	Ascites
4.2	30.4	Absent	Absent	Ascites
4.3	32.6	Absent	Absent	Ascites
4.4	29.8	Absent	Absent	Ascites
4.5	31.5	Absent	Absent	Ascites
4.6	34.6	Absent	Absent	Ascites
Mean (± SE)	**31.18 ± 0.91**			
Group 5: Other pathological lesions of the body				

5.1	10.8	Absent	Absent	Chronic reactive lymphoid hyperplasia with adenocarcinoma
5.2	08.6	Absent	Absent	Fibroma
5.3	13.7	Absent	Absent	Haematoma
5.4	08.7	Absent	Absent	Myositis
Mean (± SE)	**10.45 ± 1.19**			

obtained. In one case, the core biopsy needle, inserted up to 30.6 cm depth from skin, only sampled capsular tissue that could not provide diagnostic information. Examination of a sample from liver of a Miniature Schnauzer dog obtained by ultrasound guided tissue core biopsy, Alana (2004) found clotted blood, small areas of normal hepatocytes and collagenous connective tissue and considered the sample non diagnostic due to large amount of blood and small quantities of hepatic tissue. However, chronic hepatitis was confirmed on wedge biopsy.

In group 2 kidney samples were collected at a mean depth of 26.84 ± 1.49 mm which provided sufficient tissue suitable for histopathology in all cases. However, in three cases no abnormality was found but sample was fit for histopathology. This may be attributed to imperfect measurement of penetration depth up to the lesion as because lesion was present on cranial pole of the kidney and biopsy of renal tissue was possible only from caudal due to presence of liver at right side and spleen at left side at cranial pole. In Group 3 five splenic samples were collected at a mean depth of 17.76 ± 1.26 mm out of these two samples showed crush artifacts and found unsuitable for histopathological examination as at some occasions haemorrhage might have been take place which affected the quality of sample. These findings were in accordance with that of Rycke *et al*. (1999). In group 4, six animals in which peritoneal fluid was detected in pockets on ultrasonography, were included. Aspiration biopsy was collected at a mean depth of 31.18 ± 0.91 mm. All the samples were of diagnostic value. In group 5, four animals having lesions in different body parts were included and tissue core biopsies were collected. The mean depth of penetration was calculated as 10.45 ± 1.19 mm, which indicates that the lesions were not deeply seated. All samples were found diagnostic.

In no case post biopsy haemorrhage was detected on ultrasonographic examination carried out at 0, 30, 60, 90 and 120 minutes after biopsy. This indicated that at the calculated depth no blood vessel was damaged and no extensive tissue damage was done. Values of total erythrocyte count and haemoglobin after 24 hour biopsy showed no marked variation. However, Leveille *et al.* (1993) found major post biopsy haemorrhage in only 1.2 per cent of cases even after biopsy at a pre determined depth. Reimann *et al.* (2000) found post biopsy haemorrhage in 2.5 per cent of canine cases which was not clinically significant but they also reported that in 1.2 per cent cases serious bleeding complications were detected.

Out of 24 cases, confirmatory diagnosis was obtained in 18 samples, thus the diagnostic value was calculated as 79.66 per cent. Twenty two samples were found fit for histopathology while two splenic samples got crushed. Thus the efficacy of the technique was calculates as 91.66 per cent. Rycke *et al*. (1999) reported that the accuracy of the technique was 77, 90, 53.5 and 40 per cent for liver, spleen, left and right kidney, respectively. No tissue was obtained in 18 per cent cases of biopsy.

With this discussion it was concluded that the penetration plays vital role in obtaining biopsies from living tissues based on which a confirmatory diagnosis can be established. On the other hand it also avoids

damage to associated soft tissue and vasculature.

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