Proceeding of the SEVC
Southern European Veterinary Conference

Oct. 17-19, 2008 – Barcelona, Spain

http://www.sevc.info

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Aspirates, echo-guided percutaneous biopsies, are becoming a routine technique in small animal medicine, however the application and use will depend on the expertise of the clinician, radiologist and pathologist.

**TYPES OF INTERVENTIONALECOGRAPHY**

Interventional echography includes diagnostic and therapeutic procedures; such as aspiration and biopsies, drainage of cysts or abscesses, various types of centesis and placement of catheters for drainage. This technique is non-invasive and low cost in comparison with conventional surgery.

The types of interventional echography most frequently performed are:

- Fine needle aspirate
- Aspirate with larger gauge needle
- Biopsy

**TECHNIQUE FOR FINE NEEDLE ASPIRATE (FNA)**

The FNA refers to small gauge needle (21-25 G), generally hypodermic of 2.5cm length connected to a 5ml syringe. If the sample is located at deeper level, spinal needles can be used. With this technique we can obtain tissue samples for culture, antibiotic sensitivity and cytologic examination. The FNA and cytology will often provide a final diagnosis in conditions such as hepatic lipidosis and lymphoma.

The FNA is not only diagnostic but also therapeutic, for the drainage of cystic lesions.

**TECHNIQUE FOR ASPIRATION WITH LARGER GAUGE NEEDLE (LNA)**

The applications of LNA (18-20 G) are similar to those of FNA. However, the risk of complications or contamination is higher. The advantage of this technique is that we will visualize the needle more easily and we obtain a larger sample for cytology, culture or sensitivity and, in case of drainage, the procedure will be faster. The main application of this technique is to obtain aspirates from nodules (hepatic regenerative nodules) and masses of 1-3 cm.

**BIOPSY TECHNIQUE**

There are in the market a wide range of biopsy needles, the most popular is the automatic needle Trucut. The range of these needles is from 14 to 18, G penetrating a length from 10 to 22 cm. The technique for biopsy is a lot more invasive than FNA/LNA, being the risk of haemorrhage much higher. Therefore, all patients undergoing echoguided biopsy will need to have an assessment of the coagulation profile (prothrombine time and partial thromboplastine time). Additionally, the patient will need to remain still for sampling, requiring deep sedation or general anaesthesia. The main advantage of
the biopsy technique is the size of the sample obtained. This technique is used for liver, kidney and prostate biopsies and for masses larger than 3cm.

TECHNIQUES FOR FNA, LNA AND BIOPSY

To apply these techniques, we should take into consideration the following precautions:

- Evaluate the area where we are going to sample from, to characterise the lesion and its relation with adjacent structures, in order to avoid damage to other structures such as vessels, nerves or other vital organs.
- The lesion has to be assessed in different planes and we should use the shorter path to reach it.
- The sampled area has to be examined between 4 and 6 hours after an echo-guided biopsy has taken place, to check for possible haemorrhage.
- Before taking the biopsy, the skin and the transducer have to be cleaned and we should apply an antiseptic preparation to the area.
- Use sterile gel.
- The progression of the needle through soft tissue has to be visualised via echography all along the procedure. The needle will appear as a shiny echogenic line if the transducer is placed longitudinally along the same axis as the needle. If the needle is not parallel to the transducer, we will only be able to visualise it as an echogenic dot. If this happens we should rotate the transducer gently to provide the right angle and at the same time slowly move the needle till this is visualized.
- To perform a FNA, we recommend to swiftly advance towards the area where the lesion is located to then withdraw the needle avoiding aspiration with the syringe.

TYPES OF TECHNIQUE FOR BIOPSY

Different biopsies can be carried out with a free hand or using a guide for the needle. The decision on which technique is personal. However, with a free hand we will have more flexibility to reach small structures.

ADVANTAGES
The main advantage of echo-guided biopsy over open biopsy is the speed, safety and reduced morbidity, as well as cost.

DISADVANTAGES
One of the main disadvantages could be the difficulty visualizing the needle and the lesion.

COMPLICATIONS
The percentage of complications tends to be low if the protocol for biopsies is followed correctly. Amongst the possible complications we can encounter are haemorrhage and dissemination of tumoral cells1.

TECHNIQUE AND COMPLICATIONS IN DIFFERENT ORGANS2,3

Liver
If the hepatic disease is diffuse, we can obtain the sample from any hepatic lobe. The most frequent approach is caudally to the xiphoid apophysis and left from the midline, keeping the patient in dorsal recumbency. In this way we can access the left lobe, which is larger in size and we keep away from the gall bladder and hepatic hilium. However, if the patient has a deep chest or is obese, has a small liver or has a large amount of air or food in the gastrointestinal tract, it might not always be possible to have this approach. In these cases, we will choose an intercostal approach, placing the animal in right lateral recumbency and accesing more ventrally, or with the animal in sternal recumbency with ventrolateral
approach.
In diffuse disease, FNA is useful in case of infiltrative neoplasia such as lymphosarcoma and mast cell tumour, hepatic lipidosis and suppurative hepatitis. In case of other infiltrative pathologies like vacuolar hepatopathy and other type of hepatitis, biopsy is preferable. When the lesions are focal, the FNA is useful to differentiate between a metastatic nodule and granuloma, whereas biopsy will be necessary to differentiate between a regenerative nodule of a primary neoplasia, particularly hepatoma.

**Gall bladder**
FNA with a spinal needle (22-G and 9cm) of the gall bladder is usually the most frequently used technique to reach the diagnosis of cholecystitis. The approach is similar to the one of the liver whereas the biopsy is taken from the right hand side on dorsal recumbency. The needle is directed towards the gall bladder through the hepatic parenchima to decrease the possibility of bile leak. This technique should be avoided when the gall bladder is very dilated and appears obstructed because the risk of leakage is very high in this cases.

**Spleen**
FNA is performed on a regular basis and is a useful technique to evaluate diffuse infiltrative processes such as lymphosarcoma and mast cell tumour. We can also use the technique of FNA in cases of small nodules or masses. Biopsies of the spleen are not recommended due to the high risk of haemorrhage.

**Pancreas**
Pancreatitis and pancreatic neoplasia often appear similar clinically and on imaging so FNA or biopsy are finally required to reach a final diagnosis. The sensitivity of FNA for pancreatic carcinoma is of 65-85% because we often find inflammatory or necrotic tissue next to tumoral tissue. Therefore we could achieve false negative results. The biopsy will increase significantly the risk of pancreatitis, that is why it should only be carried out if FNA has failed. Pancreatic pseudocysts can be drained by means of echography.

**Kidney**
FNA of masses is a relatively routine procedure to differentiate between neoplastic an inflammatory processes. The biopsy is recommended in cases of diffuse disease, especially in those with evidence of protein losing nephropathy, neoplasia or infection. The cortex of the caudal pole is the area of choice to take the biopsy, being required several samples, with a maximum of 5. We should avoid the areas of renal pelvis and medulla. The kidney of cats and young dogs will have to be immobilised manually because they are very mobile. Perirenal haematomas and haematuria are frequent after biopsy, therefore these complications should be anticipated and treated with diuresis via fluid therapy until haematuria is decreasing.

**Adrenal glands**
Adrenal glands should not be sampled for biopsy when a pheochromocytoma is suspected.

**Urinary bladder**
Echo-guided cystocentesis is performed on a routine basis to obtain sterile urine for urinalysis. An FNA can be taken of a mass in the bladder for cytology. Percutaneous biopsies are not recommended due to the frequent complications which can occur like urine leakage, haemorrhage and dissemination of tumoral cells into the abdominal cavity.

**Prostate**
The increase of the size of the prostate can be due to various pathologies and the interventional echography can help differentiate between these conditions: prostatitis and neoplasia, drainage of cysts, abscesses and periprostatic cysts. The FNA can be used in all of the above mentioned processes with the exception of the drainage of prostatic abscesses, where we will need to perform a LNA instead. Biopsy will be necessary in order to differentiate between prostatitis and neoplasia. When a biopsy is taken, we should avoid the central area in order to avoid the prostatic urethra.
Gastrointestinal tract (GI Tract)
The FNA is the technique we use more oftent in GI tract. The lesion has to be measured to avoid penetration into the intestinal lumen, particularly colon.

Ovaries
It is not advisable to aspirate ovarian masses to avoid the risk of carcinomatosis in the abdomen.

Lymphnodes
An FNA is usually enough to obtain a final diagnosis of a lymphnode of increased size.

Lungs
We can perform a FNA in the lung in those cases where there is a focal infiltration or a mass in contact with the pleural surface. The diagnosis will be reliable in malignant lesions and variable in inflammatory processes. The possible complications are pneumothorax and haemorrhage.

Bone
FNA is useful to obtain samples of aggressive bone lesions or to differentiate between neoplastic lesions and osteomyelitis.

Other applications of interventionist echography

Apirate of cysts, abscesses and haematomas and introduction in situ of drugs
Interventional echography is useful to drain hepatic, renal periprostatic and perirenal cysts as well as sclerotherapy of those or to introduce antibiotics. Abscesses appear as hypo-echogenic cavities with irregular borders and my contain septa inside. The aspiration with a 18-20G needle may be necessary to obtain a sample. Haematomas can be drained to facilitate healing.

Effusions
Percutaneous echography will help us identify and classify the free fluid in the cavity (abdominal, pleural, pericardic), to select the type of needle and its placement and estimate the amount of fluid.

Contrast techniques guided by echography
The injection of contrast medium by means of echography can be beneficial in those animals which are weak or in a critical condition. The contrast techniques that can be carried out via this method are colecystography, introduction of 2-4ms of ionic or non-ionic iodine contrast inside the gall bladder and a radiography is taken afterwards; anterograde pyelography is a useful technique to diagnose urethral obstruction. 4-6ms of ionic or non-ionic iodine contrast is introduced into the renal pelvis after emptying the renal pelvis, and xrays are taken immediately after.

REFERENCES

