NEW ASPECTS OF BRACHYCEPHALIA IN DOGS AND CATS
DIAGNOSTICS: IMAGING AND FUNCTIONAL TESTING

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IMAGING

Imaging, predominantly computed tomography and endoscopic examination, is the diagnostic key to brachycephalic syndrome. Landmarks being investigated followed a standard protocol. Starting rostrally, the nares and their narrowing were analysed with a focus on the alae nasi. Caudal to the vestibulum nasi the conformation of the plicae recta, alaris and basalis laterally as well as medially the ventral and dorsal swell bodies of the septum were rated for symmetry, obstructions and therefore the wideness of the incipient nasal meatus. Aberrant growing conchae were classified according to the direction their branches spread (see below). In addition, the pharynx, larynx, trachea and bifurcation were examined.

Our studies suggest intranasal stenosis by nasal conchae be one of the main factors in BAS. Based on this assumption endoscopical resection of obstructive conchal material using a diode-laser fibre was developed (Laser-Assissted TurbinEctomie = LATE). The influence partial turbinectomy has on intranasal airway resistance has not been investigated to date. In order to evaluate surgical success objectively, intranasal airway resistance excluding influence of nostrils and soft palate was measured before and after LATE-surgery had effected an open meatus nasi ventralis. In addition, long-term-effect on airway resistance was investigated.

Preoperative CT-scans of the nares showed the alae nasi adjoin much closed to the septum nasi and obstruct the nasal vestibulum in all cases. But the alae nasi and especially the “closing fold” (located at the transition between the pigmental vestibulum nasi and non pigmental nasal cavity) occlude the nasal entrance at a point that was not visible without an endoscope. Caudal to the vestibulum the folds (Plicae recta, alaris and basalis) and the nasal meatus are narrowed and asymmetrically.

Extreme shortening of the craniofacial skull and thus of the nasal cavity, leads to abnormal configuration of the conchae. Two main types of aberrant conchal growth can be described:

1. rostral, aberrant conchae obstructing the nasal passage (**RAC**) and
2. caudal aberrant conchae obstructing the choanae (**CAC**).

Furthermore, these conchae are characterised by a low degree of branching and crude lamellae. This is confirmed by histological examinations. The severe intranasal deformities in brachycephalic dogs described here are the basis for a new pathophysiologic understanding of BAS. Detailed structural analysis of aberrant, stenosing conchae (RAC, CAC) is an indispensable precondition for the development of an intranasal surgical therapy of BAS in the form of partial laser-assisted turbinectomy (LATE therapy).

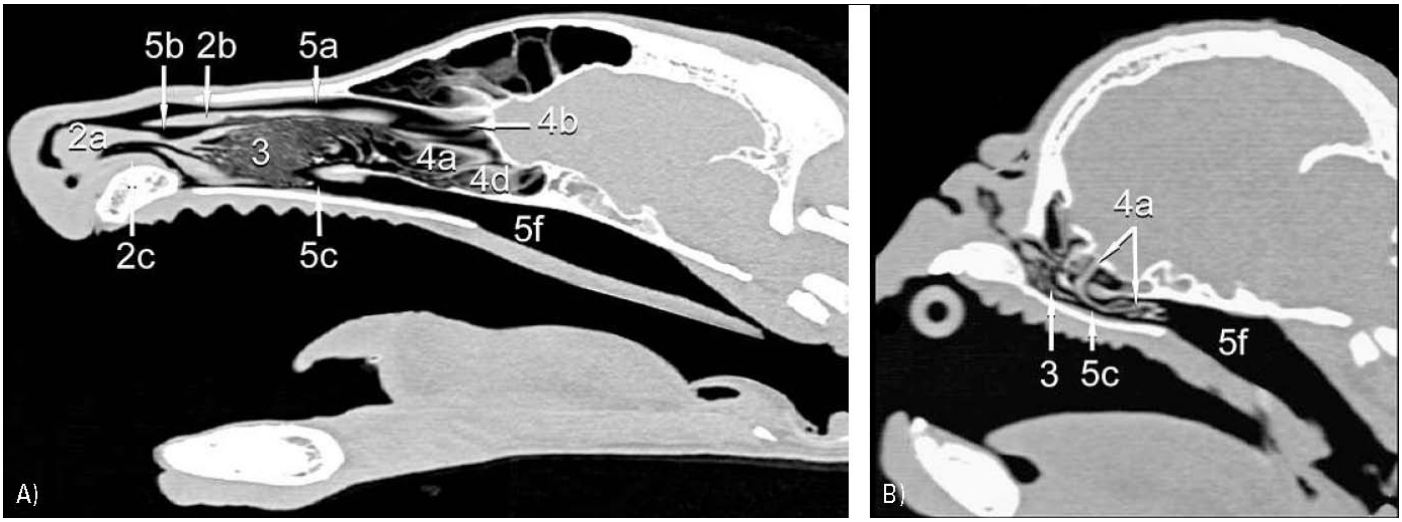

Figure 1: Sagittal CT-Scans of a normocephalic and a brachycephalic head (OECHTERING et al. 2007)

2a =Plica alaris, 2b =Plica recta, 2c =Plica basalis; 3 =Concha nasalis ventralis; 4a =Concha nasalis media (Endoturbinate II), 4b =Concha nasalis dorsalis (Endoturbinate I), 4d =Endoturbinate IV; 5a =Meatus nasi dorsalis, 5b =Meatus nasi medius, 5c =Meatus nasi ventralis, 5f =Meatus nasopharyngeus

FUNCTIONAL TESTING

However, neither endoscopic nor computertomographic evaluation allow objective assessment of intranasal airway resistance. This is only possible using reliable functional testing (GRUTZENMACHER et al. 2003; WIESTNER et al. 2007). Impulse-oscillometry was performed on 25 dogs (10 Pugs, 15 French bulldogs) that showed severe symptoms of BAS. Nasal airway resistance of each nasal cavity was measured in anesthetized and spontaneously breathing patients both pre-operatively and one week post-LATE-surgery. For ten of the patients, impulse-oscillometry was also performed three to six month after surgery. By inserting plastic tubes into the nostrils, influence of these structures on airway resistance could be eliminated. The influence of the soft palate on airway resistance was eliminated by retraction of this structure using a hook-shaped instrument or measuring

after staphylectomy (Fig 4A and 4B). The upper airways of all patients were subsequently investigated by endoscopy and computed tomography.

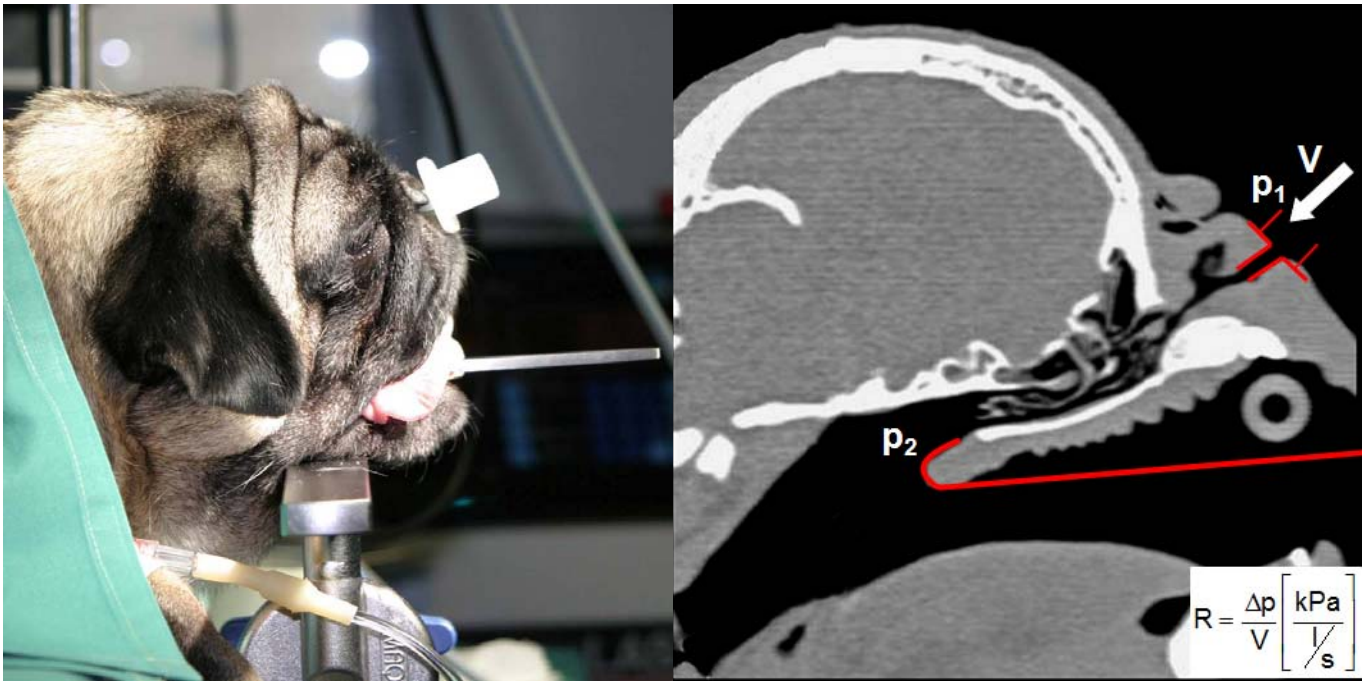

Figure 2: Measurements before and after LATE-surgery, procedure of impulse oscillometry (HUEBER et al. 2007)

A mean percentage decrease in resistance could be shown in all examined dogs (25) of 69 %. In the patients mean intranasal airway resistance was 1,35 ± 0,54 kPa/(L/s) preoperative and 0,54 ± 0,25 kPa/(L/s) postoperative. A mean percentage decrease in resistance of 54 % in pugs and 62 % in French bulldogs could be observed (Fig. 5). Pre- and postoperative intranasal airway resistance in Pugs was significantly greater than in French bulldogs ($p < 0,1$ und $p < 0,01$). Patients for which impulse-oscillometry was performed three to six weeks postoperative, showed a mean percentage decrease in resistance of 60 %. From preoperative to three to six month postoperative there was a mean percentage decrease in resistance of 55 %.

Partial turbinectomy (LATE) results in a significant decrease of intranasal airway resistance in dogs with BAS. Differences between breeds are probably due to differences in body size or/and length of nose. A lower resistance could be observed in dogs with a greater body weight (French bulldogs) than in smaller dogs (pugs). This is consistent with our clinical observations in which French bulldogs evidence fewer symptoms than pugs. LATE-surgery reducing intranasal airway resistance shows an immediate short term and good, stable, long-term effects. The results of this study indicate LATE being an effective and reliable therapy for intranasal airway obstruction by nasal conchae.

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