

2.1.4 Results

From 1984 to 2000 we have treated 1630 children with 2250 hemangiomas and 240 children with VMF. More than 90% of the angiomas were located at the head and the neck, 51 in the airways, 11 in the GI-tract and 2 in the urinary bladder. The remaining 10% of hemangiomas were located equally in all regions of the infant. Additionally more than 170 children with lymphangiomas were treated. The number of laser applications have been 1 to 3 sessions for capillary hemangiomas, 2 to 3 for venous and 4-6 to 10 sessions for AV-malformations and lymphangiomas. The postoperative residuals and alternations of the skin are the same as in spontaneous involution: atrophy and chالasia of the skin, hyperpigmentation, hypopigmentation and scar formation (seldom).

2.2 Lymphangiomas

The treatment of lymphangiomas in children is an unsolved problem till now. The complete surgical excision is complicated by damage to the surrounding tissue and organs. The intralesional injection of OK 432 and insertion of sclerosing solutions is successful only in a small number of cases^{12,13}. Lymphangiomas become symptomatic due to enlargement, compression and infiltration of adjacent structures. Type, localisation and extension are decisive factors for the treatment, which is interdisciplinary and multimodal. Interstitial laser therapy (ITT) is a minimally invasive therapeutic technique to create thermal lesions in pathological tissue and has frequently been applied for different indications.

2.2.1 Clinical course

The clinical appearance is depending on the age of the child, localisation of the lymphangioma, the dynamics and form of the growth: infiltrating-proliferative (L. simplex and cavernosum) or expansive (L. cysticum). Furthermore, the filling volume of the cystic part may spontaneously change the size of the tumour.

Lymphangiomas have been classified into three groups: simplex, cavernosum, and cysticum, often associated with fibrous and microcystic (so called "solid") parts. In association with bone manifestation it is known as GORHAM STOUT disease. Lymphangiomas occur with equal frequency in males and females. They appear quite early, often being observed at birth. More than fifty percent of the lesions reported in the literature appeared before the end of the first year of life. In most of the cases they become manifest rather suddenly and grow quite rapidly. More than 80% of all lymphangiomas are complicated by inflammation, bleeding into the cysts or in cases with

Localisation	Number of children
Head	63
Larynx, trachea	5
Neck	22
Supraclavicular area	11
Thoracic wall	19
Axilla	14
Mediastinum	9
Abdominal wall	6
Mesenterium, omentum	6
Retroperitoneum	6
Spleen	3
Pelvis	2
Genitalia	3
Skin	3
Bone	4

Table 2.2.1: Localisation of lymphangioma n= 176 (UKBF Berlin, Germany 1986-1999).

spreading in the retroperitoneum and mediastinum followed by ascites and chyloperitoneum, respectively by chylothorax. Immediate therapy is recommended.

2.2.2 Diagnosis

There is a very high importance in making a correct preoperative diagnosis. Plain films of the abdomen or thorax may show displacement of the organs. Ultrasonography shows a hypoechogenic multilocular or solitary mass. MR-Imaging is to performe, in transverse and sagittal or coronal planes and with contrast medium in all children. MRI made it possible to estimate the relation to the adjacent organs, vessels and nerves. Moreover, it allowed an optimal positioning of a Titanium alloy needle for application of the laserguide. Follow up studies could be carried out with high accuracy.

2.2.3 Therapy

The therapeutic procedure used for treatment is depending on the anatomical and physical presentation of the lymphangiomas. Their high tendency to infiltrate and surround adjacent tissue, organs and other vital structures makes operative resection challenging and often it is incomplete. The results of laser therapy of lymphangiomas compared to conventional surgery are good. Recurrences and complications are poor. Therefore, we introduced the laser therapy in the therapeutic management of the lymphangiomas. We prefer the Neodymium YAG-Laser 1064 nm, Fibertom, Dornier. The laser is equipped with a light-guided protection system (LPS) so that huge carbonisation and subsequent fiber burning by means of pyrolytic light defection can be avoided. Hence, the laser is stopped automatically before the fiber is overheated and damaged. We use a sterile bare fiber with 0.6 mm in diameter, introduced by MRI-guidance or by sonography, respectively by laparoscope or thoracoscope. For percutaneous MRI-guided laser application a Titanium alloy needle (diameter 14 gauge, length 100 mm, somatex) is necessary¹⁴. The laser power ranges from 4-6 watts. For laparoscopic-assisted laser therapy we use the 2 and 5 mm instruments (FA Storz) and a bare fiber of 0.6 mm, introduced under optic control. Therefore, we prefer the Jakoubek hand piece with a flexible top. By laparoscopy we fenestrate the cysts of the lymphangioma using the fibertom mode in contact mode, continuous wave, 20-30 watts. The same procedure is applied for excision of the cysts and solid parts. Deepithelisation of the cyst wall is realised with 25 to 35 watts in non contact standard mode, exposure time 0.3 sec, intervall 0.5 sec. For interstitial lasertherapy we introduce the 0.6 mm bare fiber percutaneously, using a power of 4-6 W cw. [Fig. 9]



Fig. 9: Multicystic lymphangioma of the right supraclavicular fossa before and after one laser application.

2.2.4 Results

176 children presenting with a diagnosis of lymphangioma were treated by laser from 1986 to 1999 in our hospital. The age at therapy ranged from birth to 12 years. 90% of children having the diagnosis made at 2 years of age or younger. In the most of the children were involved the face, mouth, and neck. Other sites included axillae, mediastinum, retroperitoneum, omentum, genitalia and the upper and lower extremities. The Nd:YAG laser was applied in 150 children by the percutaneous puncture-technique (ITT) and in 17 children by thoracoscope and 9 children by laparoscope. 2-3 sessions were necessary to achieve the final result. Lymphangiomas at the pharynx, tongue and other parts of the oral cavity recurred in 15 children. In this group 6-10 sessions were necessary.

Total	176
1 session	55
2 sessions	61
3 sessions	28
4 sessions	14
more than 4	18

Table 2.2.2: Number of laser applications in 176 children with lymphangioma. (UKBF Berlin 1986-1999)

All children are alive. In the laparoscopic and thoracoscopic groups no complication occurred, in two children a second session was necessary. Further complications were in two children, both temporarily with spontaneous healing, a paralysis of femoral nerve and a stricture of the right ureter due to the scar formation. In 2 infants necrosis of the adjoined skin occurred. [Fig. 10]

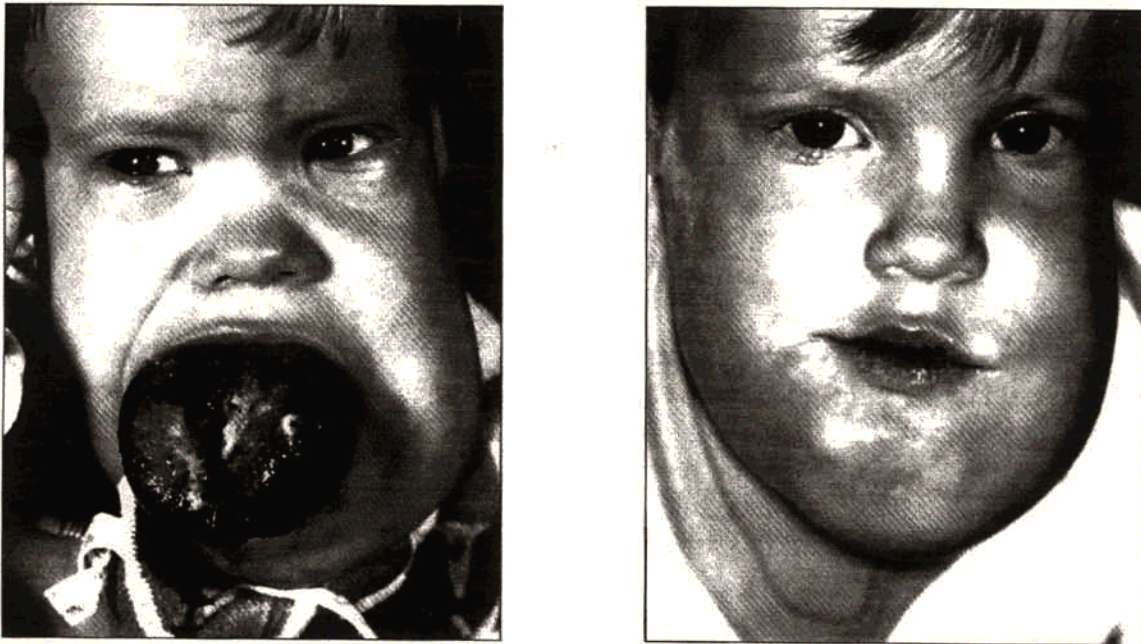


Fig. 10: Lymphangioma of the tongue and left face in a 1 year old boy: before and 3 years after laser treatment.

2.3 Laser in thoracic surgery in children

2.3.1 Lung

We use the Nd:YAG laser 1064 nm, focusing handpiece, non-contact mode, spot 1.5 mm, 90-100 W, cw. The advantages of the Nd:YAG laser in thoracic surgery can be seen in the bloodless dissection with simultaneous sealing of the cutting-surface¹⁵. The cutting surface is water-proof and airtight, so that incisions and even resections can be done on the ventilated lung. The sealing effect