

Ischemia Tissue Left in Human Body

Human Vessel Ligation

There are presented studies in which there is left tumorous and non tumorous ischemia injured tissue left in human body despited aim of the study. Faith of the tissue and risks of such procedures are of particular interest.

Horsley in 1890 quoted one of professor Kocher's patients who suffered a severe myxoedema after a previous, albeit unintentional, removal of the whole thyroid gland. This condition was solved by intraabdominal transplantation of 'an apparently normal thyroid tissue from a goitre'. A rapid improvement followed the procedure. The effect lasted for three months when the graft atrophied. Another transplantation followed, the effect lasted for nine months. No complications are mentioned. Professor Koch performed another transplantation of a goitre graft in 1883 but the graft was soon absorbed. Professor Koch performed another 5 transplantations in 1889. In two cases half of the thyroid gland was fixed to the abdominal wall. These procedures were in both cases followed by „aseptical exfoliation“. Loose placement of the graft in the abdominal cavity was performed in 3 cases. No complications are mentioned. One patient had greatly improved since the operation. (30)

Mayo in 1909 summarizes experience with ligation of certain thyroid arteries and veins and at times portions of thyroid gland made in over 200 operations and ligation of superior thyroid arteries and veins in 225 cases operated for hyperthyroidism. Immediate post operation death rate in ligation of the superior thyroid arteries and veins was 2 percent occurring within a few days. He recommended the procedure in cases of mild hypothyroidism or in cases of severe exophthalmic goiters and in patients with secondary symptoms like dilatation and degeneration of heart, fatty liver etc. He noted safety of this procedure compared to theroidectomy. It is worth mentioning that the operation wound was closed without a drainage (31).

Rogers in 1918 summarizes 296 patients treated by ligation of up to all 4 of the chief thyroid vessels for hyperthyroidism. 70 per cent of patients were cured, 14 per cent improved and 8 patients unimproved with the death rate of 3 per cent. Thyreoidectomy as mentioned had 20 to 25 per cent of failures with death rate between 5 to 10 per cent. Guadruple ligation is according to Rogers usually followed by subjective improvement but tachykardia and calorimeter test subside for a long time or for months. There is mentioned a period of hypothyroidism during recovery as a negative effect of the operation which can be relieved by 'cautious administration of small amount of thyroid material' (32).

Holt in 1907 presented a concomitant vein and artery ligation as an alternative to nephrectomy in the cases when nephrectomy is not possible. He tried unsuccessfully to nephrectomise four times a patient who sustained a left kidney rupture healed by massive scar tissue and a sinus through which pus and urine freely discharged. The ligature was successful and even the sinus healed. Discharge from the sinus was scanty and smelt faintly of urine for the first few days after the operation. At the fifth day an unusual large amount of discharge came. This time it has not urine smell and this smell did not appear again. Healing finished 57 days after operation. The patient wrote to Holt two years after the operation reporting to be in a good health earning his living and writing that the sinus had never reopened (33).

Lo Ching-Chu et cal. in 2003 summarize their experience with 45 patients in whom they induced avascular necrosis of gastric polyps by application of rubber bands at the polyp's base. 72 polyps were treated thus. The ligation was immediately followed by congestion. 4 minutes later cyanosis developed. Two weeks later at the follow up endoscopy all polyps dropped off except one which dropped spontaneously during next follow up endoscopy. They do not report complications during or after the procedure (34).

Foetal reduction is a method used in contemporary medicine. I do not intend to discuss the ethical aspect of this subject, however, the retention of stillborn foetus or foetuses is probably

a situation in which human body is exposed to the most extensive range of different antigens. Therefore there is a need to mention time specific changes connected to foetus retention. Genest and cal. investigated post mortem changes in stillborn fetuses (35, 36) and placentas (37) in an attempt to identify time specific changes connected to death to delivery intervals (DTDI). A stillborn foetus undergoes nonputrefactive maceration on macroscopic level and autolyses on microscopic level (35). The earliest autolytic predictor of DTDI identified was a loss of nuclear basophilia in individual cells in renal cortical tubules DTDI of 4 hours, the final one was the loss of basophilia in kidney DTDI 4 weeks (35). The earliest maceration DTDI specific predictor identified was desquamation measuring at least 1 cm in diameter and brown red discoloration of the umbilical cord stump DTDI of more than 4 hours, the latest was mumification DTDI more than 2 weeks (36). Extensive fibrosis of terminal villi is a time specific change in placenta connected to DTDI of more than 2 weeks (37). These studies show that degrading foetus can stay inside the mother's body for a long time and this fact urges the need for investigating DTDI.

A foetal reduction can be performed from the first to the third trimester. Reduction in triplets is normally performed in the first-trimester, in twins in the second-trimester or onwards (38). There are two groups of methods to be used dependent on chorionicity of fetuses. Injection of filtered air into an umbilical vessel, injection of KCL into fetal heart or umbilical cord can be used in dichorionic twins. On the other hand, there is need to provide complete occlusion of arterial and venous flows in monochorionic twins to prevent death of the non reduced foetus by a lethal agent or by acute haemorrhage from the co-twin into dying foetus. There are many methods which can be used in monochorionic twin reduction to occlude cord vessels such as cord ligation, embolisation of the cord with sclerosant agents monopolar thermocoagulation, bipolar coagulation, coagulation induced by high energy radio waves. There are some methods that can induce coagulation of intrafoetal vessels as interstitial laser monopolar thermocoagulation or application of high energy radio waves (39). A regression analysis of 274 IVF pregnancies showed that a viable foetus on ultrasound at the eighth gestational week reduced gestation by 3,6 weeks and that medical or spontaneous reduction of each foetus could be expected to gain 3 weeks of gestation time (40). Other authors indicate that foetal reduction can slightly increase pregnancy loss but gain gestational time (38). Hern reports four cases of foetal reduction in dichorionic diamniotic twin pregnancies induced by KCL as late as 32 weeks of gestation. The pregnancies lasted for two days up to four weeks after the procedure with a delivery of healthy surviving twin (41).

Jacques studied changes in placentas up to 52 hours in medically reduced second-trimester fetuses. Time non specific degradation changes were found (42). Presence of post reduction inflammation as a marker of the mother's immunity response to foetal death is also of note. Lember found that only 35% pregnancies were positive for the presence of chronic inflammation in reduced placenta. The presence of chronic inflammation shortened gestational time (43). It must be taken into account when evaluating these reports that pregnancy is not just a state of immunosuppression but that the status of mother immunity depends on the stage of pregnancy. First and early second-trimester and the time of parturition are proinflammatory (44). There is no mention of any negative effects that could be linked to inflammatory response in the co-fetuses or mothers (45; 46; 41; 47; 39; 40; 42; 43).

Franklin in 1897 summarises his experience with 15 patients who were treated with transvaginal ligation of the basis of broad ligaments as a therapy for uterus fibroids, sometimes in combination with unilateral ligation of ovarian artery. The ligation of broad ligament included all vessels and nerves. According to him, the best results described as 'prompt and decided relief of symptoms and a rapid reduction of the tumour' can be expected in cases of small and incipient interstitial fibroids or in cases of continuous and profuse haemorrhage. The size of most of the reported fibroids is described as the size of 3 to 4 months pregnancy. He also reports a case of successfully recovered patient who was treated by Dr.

Humiston by unilateral ligation of the base of broad ligament. The patient was preoperatively nearly moribund from haemorrhage (48).

Franklin's observation was recently confirmed by Akinola and cal. in 2009. They performed bilateral uterine artery ligation for the treatment of uterine fibroids. Fibroid and uterine volumes were controlled by ultrasound. A significant reduction in the mean fibroid volume, mean uterine volume, and mean menstrual pain rating was shown. The method is reported to be safe and effective for the treatment of symptomatic uterine fibroids (49).

Loop-and-let-go is an endoscopic procedure. The basic principle of this procedure is to ligate treated structure by a loop and leaving it in the body. Velosa and cal. treated in this way a large pedunculated ileal polypoid lipoma. The base of the polyp was tightened until mucosal congestion was achieved. 4 weeks later a complete resection was confirmed by enteroscopy. No immediate complications were reported. The patient was monitored for 12 months (50). 8 cases of GISTs were treated in the same way as in Binmoeller's summary. Non-malignant GISTs were chosen. Mean size was 24 mm. Pedunculated as well as non pedunculated tumors were ligated. Post procedure complications were reported. Pain responsive to analgesics in all patients lasted for several days. Post operative bleeding was reported in two patients. One patient underwent subsequent ligation the other surgery. The surgery was performed two weeks after the ligation. An ulcer at the site of treated tumour was found. No macroscopic or microscopic presence of residual GIST was proved. Mean follow up of all the patient was 16 months. No patient had a recurrence of the disease (51).

Stuard-Low W. published a case study of an improvement in a case of a very rapidly growing 'epithelioma' covering over and projecting into larynx whose 'growth was certainly of a malignant nature' in 1908. An enlargement of thyroid gland in the neck was diagnosed. Ligation of all vessels of the left lobe of thyroid in combination with tie of the superior thyroid of the right lobe were followed by a partial extirpation of the epithelioma. The patient was followed up for 5 months at the time of publishing. His improvement continued until then. The only mentioned complication was due to the loss of epithelioma mass during operation causing choking of the patient. The ligated lobe 'came away in the dressing with the ligatures' (52).

Swanson and cal. summarize in their report 100 cases of patients with generalized renal carcinomas treated by delayed nephrectomy after previous angioinfarction induced by embolisation with inert material in 1983. 88 of these patients were postoperatively treated by parenteral progesterone. The time period from embolisation to nephrectomy lasted from several hours to 10 month with median interval of 5 days. 28 patients responded, 7 of them with a complete regression of all metastases, 8 with a regression greater than 50 % and stabilization for longer than 1 year. Patients with parenchymal metastases only had the best survival rate which was at 64 % after 1 year of the follow up (53).

Repetitive ischemia reperfusion tumour therapy was applied for patent protection by a US patent No. 5,072739. The patent protects endovascularly induced repetitive ischemia. A combination of ischemia-reperfusion injury is thought to cause a rise of ROS levels in tumour tissue. ROS should cause lyses of tumour cells and hence a reduction in tumour volume. The procedure is recommended to be repeated as many times as until a desired volume reduction is achieved (54).

Brush C. A. reports two cases of successfully treated patients with meningeal tumors by ligation of its vessels performed in 1902 (55).

Huurman VA. et cal. report a case of successfully treated 35 years old female with acute intra-abdominal haemorrhage originated from intrahepatal tumour with a diameter of 7 cm in 2006. Embolisation was done to control haemorrhage with success. The tumour was vascularized arterially only. Patient underwent resection of the treated tumour 6 months later in line with the department's protocol. Advanced necrosis of tumour did not make a histological diagnosis possible. The diagnosis of hepatocellular adenoma was based on the history of prolonged use of COC, the age of the patient and the fact that the tumour was

vascularized solely arterially. The patient was asymptomatic for the whole post embolisation period (56).

Hassan El A. and Zohair H. treated 3 patients aged 6, 13 and 25 with tongue hemangiomas by circumferential ligation since carotid angiograms were negative for feeder vessel detection in 1998. The hemangiomas occupied whole 2/3 of anterior part of tongue in two cases. The size of hemangioma in the third case was 1x2 cm. Patients were able to normally function four weeks after the procedure. In two cases the anomalies diminished almost entirely, in one case the size reduced to half so another intervention was about to be considered. No complications were reported (57).

Reddy and cal. reported treatment of pedunculated hemangioma of the hard palate by ligating its feeder vessel in 2011. The tumour was approximately 2x3 cm in size. Diagnosis of hemangioma was made on clinical and radiographic features. Ligation at the base of the lesion was performed. The tumour shrank and became necrotic after 1 week. By the end of the second week it became pale and exfoliated itself. No adverse effects are mentioned (58).

Quarello and cal. reported treatment of placental hemangioma in the 25 week of gestation in 2005. It had the size of 38x34x44 mm. One artery and vein were identified as feeding vessels. They were occluded by laser coagulation. The child was delivered by Caesarean section at 39 weeks of gestation. Post partum examination of placenta confirmed necrosis of chorioangioma. No adverse effects are reported (59).

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