Introduction
This article demonstrates that a comprehensive medical history is necessary in order to identify the right treatment choice, and deployment of therapy, so as to achieve the best possible results.

Abstract
Coarctation of the aorta is a congenital narrowing of the aorta. This narrowing is located just before or at the level of the ductus arteriosus. The ductus is the connection between the aorta and pulmonary artery. Although coarctation of the aorta is most commonly found in infants from 1 to 3 weeks old, it can also be detected later in life. A coarctation of the aorta without additional heart defects (an isolated aortacoarctatie) is diagnosed in about 100 children per year in the Netherlands. This case study demonstrates the use of Integrative Manual Therapy in combination with Embryology.

Key words
Aorta, failure to thrive, blood flow, embryology

Introduction
The aortic constriction impedes the flow of blood to the lower part of the body, such as the intestines and kidneys. The kidneys play an important role in regulating blood pressure. The reduced blood flow to the kidneys, and lower blood pressure in the kidneys leads to more forceful pumping of the left ventricle. As a result there is more blood pumped past the constriction and an increased pressure in the left ventricle, in the beginning of the aorta, and in the carotid arteries, that originate from the arms and head.

The left ventricle will thicken (hypertrophy), because of the force needed to get past the constriction. There will be an increased blood pressure in the upper half of the body, and a drop in blood pressure in the lower half of the body. There are mild and severe forms of coarctation of the aorta.
Coarctation for infants starts at the time that the duct closes. The blood circulation to the lower half of the body can be greatly reduced. The heart has insufficient power. This condition needs immediate attention as it can lead to cardiac asthma, heart failure and death. The serious respiratory distress is caused by the hearts inability to pump normally. The heart is severely weakened. There is reduced blood flow in the body, which can cause the baby to go into a state of shock. There can also be excessive filling of blood in the lungs. The heart cannot compensate for the fluid overload, which leads to the severe weakening of the heart. In the worst case scenario the baby can go into heart failure.

As with many other congenital heart defects the clear cause of coarctation of the aorta is difficult to pinpoint. Multiple factors and sometimes other additional heart defects play a role.

Babies with a narrowing of the aorta may have symptoms such as cold legs and perhaps arms, minimal urination, shortness of breath, nasal bleeding, lethargy, poor drinking, stomach and intestinal problems. The heart has insufficient power so the baby becomes lethargic, and decreases its milk consumption.

Review of relevant literature
The cardiovascular system is the first functioning system in an embryo. The heart begins as a primitive tube with peristaltic waves of contraction starting by day 22. Blood circulates within the embryo, the placenta and yolk sac. The single heart tube is partitioned into four chambers, with a systemic outflow on the left, and a pulmonary outflow on the right.

By the end of the third week, blood flow is established within the embryo, to the placenta and yolk sac. Oxygen and nutrients derived from maternal blood in the placenta enter the embryo through the umbilical vein. The primary intraembryonic arteries are:

- the dorsal aorta,
- the intersegmented arteries between somites,
- the aortic arch arteries within the pharangeal arches in the head and neck region of the embryo.

The cardinal system of veins brings embryonic venous blood back to the heart, where it mixes with the blood from the umbilical vein. The yolk sac is important as it is the first source of blood cells that enters the embryonic circulation via the vitelline veins.

Coarctation of the aorta is a congenital narrowing that occurs near the entrance of the ductus arteriosus. Blood flows through two collateral routes in the internal thoracic arteries to get to the lower body.
- The deep superior and inferior epigastric arteries flow into the thoracic aorta.
- The intercostals arteries, with retrograde, flow into the thoracic aorta. The intercostal arteries are dilated and tortuous from the increase in blood pressure and flow.

Most of the somatic arteries of the trunk develop, at least in part, from intersegmental arteries from the dorsal aorta. They pass between each of the somites and contribute to the vertebral, subclavian, intercostals, lumbar, common iliac and lateral sacral arteries.

Success is dependent on knowing the following:

<table>
<thead>
<tr>
<th>Embryonic Vessels</th>
<th>Major derivatives</th>
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<tbody>
<tr>
<td>Aortic arch arterie 1</td>
<td>Part of maxillary arteries</td>
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<tr>
<td>Aortic arch arterie 3</td>
<td>Common and internal carotid arteries</td>
</tr>
<tr>
<td>Aortic arch arterie 4</td>
<td>Right subclavian arterie, part of aortic arch</td>
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<tr>
<td>Aortic arch arterie 6</td>
<td>Ductus arteriosus, proximal pulmonary arteries</td>
</tr>
<tr>
<td>Intersegmental arteries</td>
<td>Intercostal arteries Lumbar arteries Common iliac arteries Parts of vertebral, subclavian, and lateral sacral arteries</td>
</tr>
<tr>
<td>Umbilical arteries</td>
<td>Medial umbilical ligaments on the internal aspect of the abdominal wall</td>
</tr>
<tr>
<td>Umbilical vein</td>
<td>Ligamentum teres</td>
</tr>
<tr>
<td>Vitelline arteries</td>
<td>Celiac trunk Superior mesenteric arterie Inferior mesenteric arterie</td>
</tr>
<tr>
<td>Vitelline veins</td>
<td>Hepatic portal system Hepatic portal veins Intrahepatic segment of the inferior vena cava</td>
</tr>
<tr>
<td>Anterior cardinal veins</td>
<td>Superior vena cava Brachiocephalic veins Internal jugular veins</td>
</tr>
<tr>
<td>Subcardinal veins</td>
<td>Lower inferior vena cava Renal and suprarrenal veins Gonadal veins</td>
</tr>
<tr>
<td>Supracardinal veins</td>
<td>Azygos system of veins Segment of the inferior vena cava between the kidney and the liver</td>
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Statement of clinical hypothesis
The hypothesis is to find out if treatment on the first vessels, which are created in
the embryo, can help with a child who fails to thrive due to coarctation of the aorta. Release of this tissue tension should stimulate the embryological development, which stays the basis of life itself.

Case description
S.R., born 2005, visited the practice with his mother, in January 2012. She was concerned that her son was too quiet. When he had a conversation, he answered with what were socially expected answers. However, he was very afraid of being corrected, and his biggest fear was his mother getting angry with him. At school he had difficulty with writing. Playing in an unorganized matter, like on a playground, was very challenging for him. He would freeze when something unexpected took place. The left side of his body seemed to grow at a slower pace than the right side of his body. He was failing to thrive.

Examinations
The intake revealed the following information:

- Mother went several times to hospital during her pregnancy with high fevers, cause was unknown. There is a cyst in her uterus which could not be removed. S.R. was born in week 38 through normal birth.
- On Day 2 after delivery, mother was hospitalized with high fever again; cause was pneumonia, blood poisoning and lung edema.
- On day 3 S.R. was placed in an incubator in an effort to protect him from being infected. The skin of S.R. was already turning yellow.
- On day 4, S.R. was diagnosed with pneumonia.
- On day 6 they suspected a heart deficit.
- S.R. had surgery at day 11. Diagnosis Coarctatio aortae. The surgeons opened up the left thorax at lateral side.
- S.R. being one month old had a apneu for 45 minutes caused by the RS-virus.
- At 6 weeks S.R. had a heart catheterization
- At 6 months old he had a second aorta surgery where the surgeons cut through the sternum. The canules for the heart-lung machine were placed beneath the sternum.
- At 6 months old S.R. suffered from kidney stones in his right kidney.
- S.R. had pneumonia at least 21 times
- S.R. was/is allergic to cow’s milk. He was diagnosed with celiac disease, and suffered from eczema.
- After his first year, he suffered from convulsions during fevers. They were treated with anti-epileptic medicine.
- At the age of 1 ½ he had multiple brain infarcts, which affected his motor function and vision.
- After these brain infarcts he had tremors in his right arm and right leg. He avoided using them.
- Hemianopsie left.

Other Relevant Information:

Older brother has Asperger.
Father undiagnosed Asperger.
Parents divorced when S.R. was 3.

IQ scores of all above 125.

Initial examination
A quiet, insecure and lethargic little boy was lying down on the bed. No information whatsoever came into my hands. The first treatment hour was used to treat Shock¹. Complementary exercises were advised, for the release of the N. Vagus from the Brain Stimulating Therapy-De Jong (BSM)². They were to be done at home in an effort for me to receive more information during the next exam.

S.R. was much happier during the second exam. The GI tract was prioritized over neuro. Neurological information seems to be diffused. The left thorax is a no-go area. As the pictures shown, this makes sense to me.

Intervention
As his development was compromised during gestation, the focus of treatment started with the embryological structures so as to influence the GI tract. To have more influence on the outcome of this approach, I treated the Neurovascular Reflexes¹ was done during the first hour.
The third treatment hour was used to treat the umbilical arteries, veins and the vitelline structures as mentioned in schedule, with MyoFacial Release Therapy (MFR). The falciform ligament was treated with MFR. Treating Recovery Motilities takes most of the time the hour. Exercises to mature the embryological development, combined with exercises from BSM, were given as homework.

During the examination of the fourth treatment hour the infections of the lungs were primary over the GI tract. Treatment of Antibody, Septicemia and Systemic illness seemed to set off a lot of PFM motility, especially Gluten PFM, Radiation PFM. Strain counterstrain, for the urethers, is used to open flow and given as homework.

The fifth hour, S.R. was treated with the five oxygen related blueprints.

At our sixth meeting there seemed to be a major set back in S.R.’s recovery. It turned out that his father had not accepted that S.R. was gluten and cow’s milk intolerant. When S.R. was at his father’s, he was given gluten and cow’s milk (In The Netherlands it is usual that the child/children stay at their mother’s residence and one weekend in two weeks at their fathers residence). During the weekends S.R. avoided as much as he could (he was six years old) but during the holiday’s, when he had to stay with his father, he could not avoid gluten and cow’s milk. His N.Vagus maps primary. Neural Tissue Tension Techniques are used to start.

Meeting 7 was used to treat the GI tract followed by treating the anterior cardial veins with compression syndrome technique. All techniques were used for less then 30 seconds followed by intensive use of Recovery Motilities.

At our eighth meeting the mapping surprised me as it pointed to the left thorax. By holding one hand at the posterior left thorax and the other hand on the anterior left thorax, and by using a fulcrum technique, miracles started to happen. My hands were guided to all tissues present in the thorax, and the unwinding of the tissues was phenomenal. S.R. went into a Delta State all by himself.

Outcome
After the first treatment he seemed to be more open and present. He started to play with other children at school. His social skills developed rapidly and he was more present and aware of himself.

Shortly after this eighth treatment, S.R. had a check-up with the cardiologist and the pediatrician. Scans showed that there were no tissue restrictions to be seen in the left thorax. The specialists said, “if we didn’t know of his medical history, we would not be able to see that he had a coarctation”. The tremors have been reduced by 60%. The left side of his body was now similar to the right side.

Discussion
The IMT techniques implemented during these treatment sessions, combined with
specific exercises resulted in objective, and subjective improvement. What is critically important in The Netherlands is that it was all accomplished in just a few treatment hours. S.R. has had more treatment, after the spectacular for 8 hours, to support his development. As he is growing into adulthood, it is not correct to mention any percentage of recovery. We will continue to monitor S.R.’s progress and assess when treatment is needed.

Conclusion
By understanding the numerous aspects of embryological development, and the development of the child after birth, the Integrative Manual Therapist can reduce or eliminate the dysfunctions, which cause failure to thrive.

References

www.hartenvaatgroep.nl

[Netter’s Atlas of Human Embryology Chapter Cardiovascular system, ISBN 091416899-1]


2. Brain Stimulating Method-De Jong® by IBSM, The Netherlands