The photocoagulation site in TTTS – can we do it better?

KRZYSZTOF PREIS, MALGORZATA ŚWIATKOWSKA-FREUND, ZOFIA PANKRAC

Abstract

The laser photocoagulation of communicating vessels has decreased the fetal mortality rate in the monochorionic pregnancies complicated by Twin-to-Twin Transfusion Syndrome. The technique of photocoagulation has been changing from the time of its implementation. The aim of the study was to compare the results of treatment with the use of “Quintero technique” (coagulation of arterial side of the anastomoses) and “modified technique” (coagulation of the recipient’s side sparing the blood flow from donor to the placental lobe). Survival of at least one twin and survival of donor was similar in the group of 26 patients treated with the Quintero technique (85% and 42%) and in the group of 28 women treated with the modified technique (79% and 54%). Cerebral Palsy incidence was much higher in the group of Quintero technique (36%) when compared to 0% in the group of modified technique ($\chi^2$ Pearson test, $p = 0.01$). Coagulation of artery from donor prevents transfusion of the blood to the recipient, but excludes the lobe from the donor’s placental volume as well, even with present small donor’s veins. Closing vein of the recipient instead of the donor’s artery increases the donor’s placental volume remaining after surgery and decreases the risk of Cerebral Palsy.

Key words: twin-to-twin transfusion syndrome, laser, fetoscopy, cerebral palsy, intrauterine growth restriction

Introduction

The laser photocoagulation of communicating vessels (LPCV) has radically changed the fetal mortality rate in the monochorionic pregnancies complicated by TTTS (Twin-to-Twin Transfusion Syndrome) [1]. The technique of photocoagulation has been changing from the time of its implementation. Even today there are differences between worldwide recognized centers [2-4].

In the very beginning, the common placenta was coagulated completely along the attachment of separating membranes [5]. The attachment is usually not consistent with placental equator and thus, after this procedure one fetus (usually donor) was supplied by the smaller part of placenta. Decreased placental volume resulted relatively often with the selective IUGR (Intrauterine Growth Restriction) and its consequences including cerebral palsy and fetal demise [6].

The next step was the introduction of selective method (SLPCV – Selective Laser Photocoagulation of Communicating Vessels) based on the occlusion of the vessels connecting circulations of both twins visible on the surface of the placenta [3]. The rate of Central Nervous System damage decreased from 30-40% to around 5% and survival rates increased because this method allowed to leave all the placental volume intact [7, 8].

TTTS is a result of the imbalance of the blood volume transferred between twins through anastomoses in both directions. Even the skilled operator needs few minutes to occlude all anastomoses. So, if the anastomoses from recipient to donor would be closed as first, the donor could exsanguinate additionally to the recipient before vessels leading blood from donor to recipient would be closed. That is why occluding anastomoses going from donor to recipient first and then anastomoses going from recipient to donor was proposed. The superficial anastomoses were occluded in the end. This technique was called Selective Sequential Laser Photocoagulation of Communicating Vessels (SQLPCV). It has minimized the number of anemic donors after the procedure and increased survival rates [4, 9, 10].

Further observations showed that in some cases, despite the successful surgical procedure, the TTTS returns or reverses. That happens due to the persistence of the small communicating vessels invisible during the laser procedure, widening subsequently in the new blood pressure circumstances. To avoid that, the Salomon technique was proposed. It was based on the selective laser technique followed by the continuous coagulation of the placental surface along the line connecting previously coagulated places. This technique eliminated the risk of leaving invisible vessels communicating circulations of both twins [11].

The methods of deep anastomosis occlusion differ between operators as well. There are two worldwide recognized groups in the laser treatment of TTTS. They are the Eurofetus group in Europe and the Ruben Quintero group in the United States. The Eurofetus group recommends the photocoagulation of artery and vein (both vessels) close to the place of anastomosis. This eliminates the placental part supplied by these vessels completely [12]. In contrary, according to Quintero
opinion the coagulation should be carried out on the arterial side of the deep anastomosis leaving the venous outflow free [4].

The aim of the presented observational study was to compare the results of SQLPCV performed according to the Quintero recommendations and with a modified technique, avoiding coagulation of the donor’s arteries.

Material

In the period of 4 years (2007-2010) 54 patients were treated with SLPCV in the Department of Obstetrics of the Medical University of Gdansk. In the first 26 cases the surgical technique used was the one proposed by Quintero and called “Quintero technique” – coagulation of the arterial side of the anastomoses. Due to extremely high rate of cerebral palsy in donors in this group the technique was changed after 26th surgery.

Usually the donor’s placental volume is smaller than the recipient’s. It was hypothesized, that coagulation of the donor’s artery supplying the lobe of the placenta not only prevents transferring blood to the recipient via his vein. It may also disable the use of that lobe by the donor in the situation of presence of small, invisible veins going back to this fetus and unnecessarily decrease its placental volume [15]. The authors decided to modify the technique and avoid coagulation of the donor’s arteries to spare as much as possible of the donor’s part of placenta. The new method relied on the anastomoses occlusion only on the side of recipient and was called “modified technique”. That means that closure of anastomoses going from the donor to the recipient was performed by the coagulation of the vein and anastomoses going from the recipient to the donor were occluded as previously on the arterial side.

Results of the treatment – survival of at least one baby, survival and cerebral palsy rates in the group of donors from the consecutive TTTS pregnancies treated with the method proposed by Quintero and with the modified technique were compared. All children were assessed in the age of one year by pediatrician and in doubts consulted by the pediatric neurologist.

Methods

Data was collected in Microsoft Office 2010 Pro Excel Worksheet and analyzed in R-system (www.r Project.org) in Linux platform, \( p = 0.05 \) was significant.

Results

In the group of 54 patients the rate of survival of at least one twin was 81%. It was a little higher in the group treated with the Quintero technique, but the difference was not significant (Chi\(^2\) test, \( p = 0.568 \)). In the group of Quintero technique donor’s survival rate was 42% and in the modified technique group 12% higher, and the difference was not significant as well (Chi\(^2\) test, \( p = 0.408 \)). Results are presented in table 1.

<table>
<thead>
<tr>
<th>Coagulation technique</th>
<th>Survival of at least one twin</th>
<th>Survival of donors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( n/N )</td>
<td>%</td>
</tr>
<tr>
<td>Classical</td>
<td>22/26</td>
<td>85</td>
</tr>
<tr>
<td>Modified</td>
<td>22/28</td>
<td>79</td>
</tr>
</tbody>
</table>

The number of donors with cerebral palsy and the statistical analysis are presented in the table 2.

<table>
<thead>
<tr>
<th>Coagulation technique</th>
<th>Cerebral palsy in surviving donors</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>( n/N )</td>
</tr>
<tr>
<td>Classical</td>
<td>4/11</td>
</tr>
<tr>
<td>Modified</td>
<td>0/15</td>
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</table>

Discussion

Discussion is much limited since there are no publications on the new technique. We still do not know why the primarily successful procedure leads to the relatively high rate of cerebral palsy, even in the worldwide recognized centers [7, 8, 13, 16]. That is why centers try to explore this unknown field in TTTS treatment and develop new techniques.

Coagulation of the anastomoses proposed by Quintero in his hands increased survival rates. In our hands survival rates were similar to that achieved earlier, but the cerebral palsy incidence was extraordinary high. The group was so small, that it is hard to conclude, that the method was wrong, but the cerebral palsy rate was so high, that continuing surgery with the use of this methods seemed not ethical. No reports regarding Central Nervous System damage in relation to the place of coagulation were found in the literature to support the idea of randomized trial.

Hypothesis of sparing donor’s placental volume by avoiding coagulation of its arteries seems right. The larger placental volume of the donor remaining after surgery may be the reason of decreased cerebral palsy incidence in the group treated with “modified technique”.

Although the number of observations is small at the moment, the preliminary results are promising and suggest further studies on the occlusion site being worth.
Conclusion
The use of a new modified technique of the laser photocoagulation of communicating vessels seems to decrease the rate of cerebral palsy in donor twins.

References

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