
The Promise of Preimplantation Genetic Diagnosis

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On October 25, 1995, I gave birth for the first time, to a boy my husband and I named Henry. Henry was a sweet and precious baby, born with a rare, fatal disease called Fanconi anemia that threatened to take his life before he learned to read, climb a tree or fall in love.

Fanconi anemia (FA) is often accompanied by numerous serious birth defects and always causes bone marrow failure, necessitating a bone marrow transplant. In addition, children with FA are predisposed to cancer. In short, FA is a child killer.

When Henry was born, bone marrow transplants from matched sibling donors had a success rate around 65 percent. In contrast, the success rate for a bone marrow transplant from someone other than a sibling was reported around 18 percent, and it was our understanding that no one with the type of FA that Henry had, had ever survived an unrelated transplant.

Allen and I had planned to have several children, but Fanconi anemia made it about a whole lot more than mere conception. It was about genes and statistical probability, prenatal testing and decisions. It was about hopes, dreams and nightmares. It wasn't just about creating life, but about avoiding certain death. The very best prenatal care might be a good weapon against spina bifida, but is useless against Fanconi anemia.

In retrospect, we had a few options to consider: Hope that lightning doesn't strike twice, cross our fingers and pray for the 75 % chance that our second child would be healthy and the 18.75% chance of being both healthy and a bone marrow match for Henry; decide to stop having children; do artificial insemination using donor sperm thereby changing the inherited gene pool; or adopt a child whose genetic makeup didn't foretell premature death. We only considered the first option. The other three didn't even occur to us.

On the day we found out I was pregnant with our second child, Allen and I got a phone call that forever changed our lives. We were informed that there was a fifth option, an experimental procedure that was newly available for FA families – embryo selection using preimplantation genetic diagnosis (PGD). This procedure combines in vitro fertilization (IVF) with genetic testing conducted prior to embryo transfer. Best of all it would allow us to know at the outset of our pregnancy that our baby was healthy and, by using the umbilical cord blood collected at birth, could also be a bone marrow match for Henry. PGD had been used in the past to screen for fatal, childhood diseases like

Fanconi anemia, sickle cell anemia and cystic fibrosis, among others, but it had never been used to start a life and save a life at once.

We considered the ethical implications of this procedure, paying close attention to our role and responsibility to protect and advocate for Henry as well as our future children. Allen and I had decided that we couldn't knowingly have another baby with this disease and were therefore very comfortable using PGD to diagnose and transfer only those embryos free of Fanconi anemia. For us, that was the moral thing to do. Not because of what we could or could not endure, but because of what we knew the child must endure throughout his life. I also knew that I couldn't, or at least didn't want to, have an abortion. A significant benefit of PGD for couples facing having a baby with a fatal disease is that the procedure circumvents the psychological pain caused by being in a position of even considering having an abortion. Because there was no evidence anywhere that IVF/PGD or the collection of umbilical cord blood, posed any risk to the baby, the benefits of the procedure far outweighed the risks as we understood them.

But what about adding matching HLA (human leukocyte antigen), a trait that was critically important to the success of a transplant and thus Henry's survival, but not to the survival of the potential child? Applying PGD in this way was brand new and had not yet gained the status of ethical acceptability. We had heard talk about eugenics and sex selection and designer babies. Did HLA matching fall within the category of disease-related traits or was it non-health related and therefore a genetic enhancement?

We felt strongly that, in our case, testing for HLA fell into the category of testing for disease-related traits as the only reason that HLA is significant to our family is because it is directly connected to Fanconi anemia. We wanted the child to be disease free and Henry needed a sibling with a compatible HLA type because of the disease.

The procedure offered value to every current and future member of our family. We could have a child who would not have Fanconi anemia; secure an HLA-matched sibling donor for Henry thereby significantly increasing the odds of his survival; and prevent our family from the devastating loss of Henry. We believed that Henry's sibling would gain satisfaction from the knowledge that he had saved Henry's life, a status that is revered in our culture.

We attempted PGD nine times between January 1998 and June 2000, suffering numerous public policy-related delays that caused us to run out of time and nearly destroyed the science. Each attempt held the promise of life; each disappointment, the fear of death and then the determination to try again. During the same time period Henry's health rapidly deteriorated. He was hospitalized twice and received four blood transfusions. Henry's transplant progressed from being a distant fear to an emergency.

I had taken 353 injections, produced 198 eggs and had no successful pregnancy. We had spent nearly \$135,000, most of which was not covered by insurance, and far too many days apart from one another, our home and our life. Our hopes were raised to the highest heights and crashed to the depths of despair over and over again. There was no medical

explanation for our lack of success. Often our best embryos had FA while the poorest quality were FA-free/HLA matches that failed to produce a pregnancy. We would have undergone PGD nine more times if we had the time, but by June 2000, we understood that given Henry's failing health, his chance for survival would be even further jeopardized if we continued to try any longer.

Two weeks after my final PGD attempt, Allen, four-year-old Henry, three-year-old Jack and I left our home in Washington, D.C. and went to the University of Minnesota in Minneapolis where Henry had a transplant with the marrow of the best donor available, a 5/6 antigen mismatched unrelated donor. Henry spent the next two-and-a-half years fighting courageously against a relentless series of life-threatening complications.

On December 11, 2002, Henry died in my arms. His death certificate states the cause of death as aspergillus and pneumonia, but it should have read, "failure of preimplantation genetic diagnosis."

As it turns out, the lives that Allen and I helped save through our experience did not include Henry's. Learning from our case, the doctors were able to improve the technology, and eventually science caught up with our dream. Just as research on others that came before us gave us hope for Henry, in a way we have paid our debt to them by giving others new hope and helping others survive this terrible disease. I am certain that if it had worked for us, I would be cheering Henry on as he scored yet another soccer goal; but instead I can only wonder what he might have been as I visit his grave.

Laurie Goldberg Strongin is a former PGD patient.