Pacemakers and Their History
by Sophia Mitri Schloss

My grandpa has needed a pacemaker for a long time. He has also done the surgery to give hundreds of people pacemakers, as he is a thoracic and vascular surgeon. Pacemakers are very important machines because they can be the only way for some people to have a working, beating heart. However, when pacemakers started out, they weren’t practical or easy to deal with — they actually started out the only way for some people to have a working, beating heart. Pacemakers are very important machines because they can be the only way for some people to have a working, beating heart.

"...Pacemakers were created to help the heart do its electrical function," says Moustafa M. M. D. (my grandpa). "The heart has an electrical connection inside that is abnormal. If it is disturbed in some fashion, a pacemaker would help." The heart is made up of four chambers: two chambers on the top — the right atrium and the left atrium — and two chambers on the bottom — the right ventricle and the left ventricle. In the right atrium, there is a node called the Sinus node, and in the right ventricle there is a node called the AV node. There are inner nerves that go between these two places. "If this is far too serious a sick... that's the main need for the pacemaker."

The first pacemaker was invented in the 1950s, and started as an external machine. "An external pacemaker was a big machine... and it was connected with an electrode that is external, and put on the skin. And then a shock is coming from the machine to the heart through the skin." A normal heartbeat is around 60 beats per minute, and so the patient's skin would be painfully shocked 60 times.

After this, the obvious step was to create a pacemaker that was all internal — the implantable pacemaker. "The surgery is done to open the chest," says Mitri, "and stitch one wire to... normally... the left ventricle... and the wire is connected to the pacer, and the pacemaker is put... usually in the upper abdomen." This was a huge step forward — this way, the patient could be able to do normal activities without having a wire coming out of them.

After the implantable pacemaker, modifications were done to the pacemaker itself. "The dual-chamber pacemaker was invented, which means you are stimulating independently the atrium and the ventricle." Before this, there was only the single chamber pacemaker which paced only the right ventricle (but occasionally paced to the right atrium). However, there was a study done in 2005 contradicting that the dual-chamber pacemaker is better. "William D. Toff, MD, and his colleagues did a study testing which were more effective — single or dual chamber pacemakers. These scientists took 2012 people and gave each person either a single chamber pacemaker or a dual-chamber pacemaker. The mean annual mortality rate was 7.2 percent in the single-chamber group and 7.3 percent in the dual-chamber group. The results are practically the same, thus it doesn't really affect people whether they get single or dual chambers."

A similar study in 2006 similarly states that there really isn't a difference in the effects of single-chamber and dual-chamber pacemakers. "...no significant difference exists between physiological pacing and single-chamber pacing in mortality and stroke..." However, the single chamber pacemaker is cheaper. "Dual-chamber pacing is $2500 more costly at implantation." If the two pacemakers work with the same quality, it could be a big factor in a person's decision making when they need a pacemaker.

Research, however, is still being done all the time testing the safety of pacemakers and making adjustments. However, single-chamber pacemakers are rarely used anymore.

After dual-chamber pacemakers, a more advanced form was developed called demand pacemakers. These pacemakers wait to act until they are needed. "...if the patient has sickness in [an] area, but the sickness is not always present and is intermittent (it comes and goes)..." Another type of pacemaker that is in progress is a leadless pacemaker — it is supposed to do the same thing as a regular pacemaker, except the surgery is different, and there is no lead attached. "No lead could be a huge benefit because "Approximately 65,000 lead failures occur annually in the more than 4 million implanted pacemakers worldwide..." Between 2001 and 2010, a study was done testing the safety of the new machine. Reinoud E. Knops, MD and his colleagues took 33 people needing pacemakers and fit them with the leadless one. A year later they followed up, and found that the patients had "no pacemaker-related complications." Though there would need to be more studies in order to test the safety, Michael R. Gold, MD, PhD says that "these early results are very encouraging."