Advancements in surgical technology essay sample

Since 1932, cardiac arrhythmias have been treated by the use of pacemakers. According to the article, “ The Evolution of Pacemakers”, “ An artificial pacemaker is a device that delivers a controlled, rhythmic electric stimulus to the heart muscle in order to maintain an effective cardiac rhythm for long periods of time” (Sandro A. P. Haddad, 2006). In the earliest stages, pacemakers were quite primitive but evolved to become much more practical in size, weight and mobility. There is evidence that a raw electric current was applied externally to stimulate the heart as early as the mid-eighteenth century (Glen D. Nelson, 1993). Some of the most notable and effective early models from the 1920s and 1930s include a hand-crank devices and devices that required the use of electrical sockets. These devices required the “ plunging of a needle into the ventricle” (Glen D. Nelson, 1993). These devices were not well-received by the public and seen as blasphemous. However, Dr. Paul Zoll developed an external pacemaker in the 1950s that was widely accepted and prompted the manufacture and development of more modern pacemakers (Glen D. Nelson, 1993).

The establishment of implantable pacemakers began in 1958. Notable doctors such as Ake Senning, Rune Elmqvist and W. M. Chardack along with Wilson Greatbatch, an engineer, were all instrumental in refining pacemaking devices and making them portable with the use of batteries (Sandro A. P. Haddad, 2006). Although these pacemakers were a vast improvement on previous models, they also had a fundamental flaw. The first implantable pacemakers were asynchronous and had the potential to compete with the natural rhythm of the heart. According to the Association of Surgical Technologists, these pacemakers are now rarely used because of

the potential to cause ventricular fibrillation (Association of Surgical Technologists, 2008, p. 967). In 1964, the basic model for the modern pacemaker was introduced by Barouh Berkovits. This new pacemaker acts as a standby or demand device that only engages when the wearer’s heart falls below a set rate (Glen D. Nelson, 1993, p. 16).

This improvement also extended the battery life of the pacing system as the system was only being engaged at intervals (Sandro A. P. Haddad, 2006, p. 42). Subsequent to the first demand pacemaker, many improvements have been made to the design of the pacemaker to make it more safe, reliable and convenient. In 1971, Berkovits introduced a dual-chamber pacemaker that could sense electrical activity in both the atria and the ventricles in order to provide stimulation of both as necessary (Sandro A. P. Haddad, 2006, p. 44). As a further innovation of the demand pacemaker, rate-responsive models were introduced in the 1980s that analyze not only heart rate but also respiratory function, blood pressure and other factors to determine the appropriate electrical response (Sandro A. P. Haddad, 2006, p. 44). Another important advantage of the modern pacemaker is its ability to provide information to physicians as a monitoring device. The most recent modernizations of the pacemaker and current research are promising for patients that are diagnosed with bradycardia.

The use of lithium batteries, for example, has further decreased the need for additional surgeries to replace the energy source in pacemakers (Glen D. Nelson, 1993, p. 60). Two of the potential future applications of the modern pacemaker include treatment of both cardiomyopathy and congestive heart failure (Glen D. Nelson, 1993, p. 17). The University of Michigan is currently

working on a device that could eliminate the need for a battery altogether. Instead, the energy needed to power the pacemaker could come directly from the patient’s own heartbeats (Science 2. 0, 2012). Throughout the years, the understanding of and attitudes toward artificial pacing of the heart has changed but the overall goal has remained the same; reliable, safe and cost-effective treatment of heart dysrhythmias. Future improvements are sure to make the pacemaker lighter, more efficient and easier to implant as well as affordable for those that need them through further innovation and manufacture.

References

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