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Review Article

Pancreatic Cancer and Raising Awareness

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Pancreatic cancer affects thousands of people every year throughout the world, killing more than ninety-five percent of its victims within the first five years. Life expectancy upon diagnosis is generally only four to six months. There are many risk factors associated with pancreatic cancer, the most prominent of which is a genetic mutation. Specific symptoms indicating pancreatic cancer do not typically appear until it is in stage IV. At this point a cure is nearly impossible. The aim of this paper is to bring to light the risk factors and the general signs and symptoms that are associated with pancreatic cancer. It is hoped that by increasing awareness of the risk factors and educating the public regarding early signs and symptoms we can increase pancreatic cancer detection and cure rates.

Keywords: Pancreatic cancer, awareness, medicine

1. Introduction

Pancreatic cancer is a disease that affects thousands of lives across the country every year. In 2007 alone, 37,170 Americans were diagnosed with pancreatic cancer, and an estimated 33,370 died from it, which places pancreatic cancer as the fourth leading cause of cancer death in the U.S. alone (Maitra & Hruban, 2007). Numbers like these reflect the fact that there is a four percent five year survival rate among people diagnosed with pancreatic cancer. Despite this, very little is known about how it begins within the pancreas. While early symptoms of pancreatic cancer are known, they are not specific to pancreatic cancer. As a result, the signs a patient may show prior to developing stage IV pancreatic cancer may not lead to a diagnosis and then treatment of the disease. This leads to people developing the deadly stage IV of the disease before it is caught and more often than not leads to patient fatality. This paper will summarize the statistics surrounding pancreatic cancer and also give specific case accounts. It will review the signs and symptoms of pancreatic cancer in order to better relay the message regarding the seriousness of pancreatic cancer and to prove how raising awareness can ameliorate the low survival rate.

2. Discussion

2.0 Methodology

The information cited in this manuscript was taken from the databases present in Gale, EBSCO, and PubMed. All sources used were more recent than the year 2000 and all sources were also peer reviewed. Keywords used include pancreatic cancer treatments, pancreatic cancer, pancreatic cancer warning signs and symptoms.

2.1 What is pancreatic cancer?

Pancreatic cancer, like other cancers, is an uncontrolled mitotic division of cells. Mitotic division is when the cells divide to create new cells. Normally there are safeguards against uncontrolled mitosis, but cancerous cells ignore these safeguards and continuously divide. These cells are harmful to the pancreas, and can also metastasize. This is the case with pancreatic cancer because it is often detected so late. Pancreatic cancer is most commonly found on the duct of the exocrine gland and can obscure the flow of exocrine pancreatic juices, producing a plethora of symptoms.

However, in order to obstruct the duct, the cancer must be sizable and as such is usually very late within the cancer's development. Less commonly, the cancer begins within the islet cells, which are cells that surround the exocrine hormone producing cells of the pancreas, known as alpha and beta cells. Regardless of location, the cancers formed are firm, and can extend well beyond the main tumor location on the pancreas. This is due to its strong reaction after its initial formation, causing it to spread throughout the pancreas. Though only a few of the cells in pancreatic cancer are carcinogenic (cancer causing) in nature, the cancer undergoes desmoplasia that can aid in the spread of the cancer cells to other parts of the pancreas, and eventually to other parts of the body (Maitra & Hruban, 2007). Approximately 75% of all pancreatic cancer cases are infiltrating ductal adenocarcinomas. Adenocarcinomas are cancers that originate in the glandular tissue but spread to epithelial tissue. In pancreatic cancer, the glandular tissues are the cells of the pancreas and the epithelial tissue is the duct of the pancreas. (Maitra & Hruban, 2007).

2.2 Classifications of Pancreatic Cancer

Early cancers have varied characteristics that differentiate them. The first form is resectable pancreatic cancer. This form of the cancer occurs in 15-20% of all pancreatic cancer cases; however the treatment still has a very bleak outcome. Those who undergo the surgery for this type of pancreatic cancer are not guaranteed to live longer, as only 10-20% of patients who undergo it live another five years (Chari, 2007). Another type of early pancreatic cancer is the small version, which is less than twenty nanometers. These are classified as the T1 tumors, and are smaller than the median size of the resected tumors, which is about thirty nanometers. Of the resectable tumors, only 20% of them are of the small variety. However, resectable cancers of this type have yielded better than average results, with 30-60% of all patients who have a resectable small tumor live past five years. Curable pancreatic cancer is another type, which has a 75% five year survival rate, since it is caught while it is still small. These tumors are less than ten nanometers in size and over 85% of those tumors are still in stage I. (Chari, 2007).

Once the cancer has progressed past the early stage, it is considered unresectable. While the resectable cases have a very bleak survival rate, the survival rate after the cancer is

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considered unresectable is even lower. The following is a list of different types of pancreatic cancer from precursor to unresectable, incurable pancreatic cancer. The first group includes the PanIN I and IIs, with PanIN standing for pancreatic intraepithelial neoplasias. Neoplasias are abnormal new growths of cells. The word tumor is used to describe neoplasias that have formed a lump. This group is thought to be when the pancreatic lesions begin to form, and they are undetectable by conventional cross-sectional imaging devices. Interestingly enough, these develop differently dependent on family background. In familial pancreatic cancer, the tumors are often still invasive, while this does not occur in the sporadic types (Chari, 2007).

Another type of unresectable pancreatic cancer is the PanIN3, which is the intraductal version of pancreatic cancer. PanIN3 is generally asymptomatic despite being within the pancreatic exocrine duct. Along with the other PanIN lesions, these are not detectable by conventional cross-sectional scans. There have been documented cases of resecting this type of cancer, but with no positive results (Chari, 2007). A third type is the minute pancreatic cancers. This classification is applied when the cancer becomes invasive. These cancers are still possibly curable, and are considered to be anything less than 10 mm in size. The minute neoplasias, upon reaching 5-8 mm in length, are much more commonly invasive, while those less than 4 mm in length are still lesions upon the pancreas (Chari, 2007).

Small pancreatic cancers are those that are less than 20 mm in length and are metastatic. These small cancers are still largely asymptomatic, and only rarely appear on cross-sectional imaging. Pancreatic cancer is believed to metastasize upon reaching a size larger than 10 mm, and the risk for metastasis increases as the tumor gets larger. The next and last type is the large pancreatic cancers. These cancers are classified as tumors that are over 30 mm in length. These tumors are the most deadly because they have not only infiltrated the pancreas, but have also locally metastasized to veins and arteries, affecting blood flow throughout the body, specifically the pancreas. The cancer at this point is largely symptomatic and appears on cross-sectional images of the pancreas over 90% of the time (Chari, 2007).

2.3 Hereditary Pancreatic Cancer

Pancreatic cancer, despite the lack of awareness, has had many risk factors identified. The most dangerous risk factor that has been identified is a person's genetic makeup. It has been found that individuals with family members with the disease have a 2.3 fold risk of developing the cancers compared to a person without any family with the disease. It has also been found that the closer the relatives are with pancreatic cancer, the more at risk a person can be (Maitra & Hruban, 2007). This has been explained as an autosomal dominant inheritance of a particular gene that has yet to be identified. Phenotypic expression can vary based on the person's family line (Maitra & Hruban, 2007).

Genetic risks for pancreatic cancer put a patient more at risk for getting the disease, in some cases at a much higher risk, such as those afflicted with Peutz-Jeghers syndrome. Peutz-Jeghers syndrome is an inherited disorder in which the person develops intestinal polyps and is at risk for several types of cancers, including pancreatic cancer. However, these genetic diseases can also lead to other factors to screen for when considering preventative measures and early detection. Since Peutz-Jeghers can also carry several other easily detectable malign symptoms, discovery of these can lead to screening for the cancer causing genes, which in turn can then lead to an early detection of pancreatic neoplasias (Maitra & Hruban, 2007).

2.4 Sporadic pancreatic cancer and risk factors

2.41 Sporadic

Sporadic cases of pancreatic cancer, which occurs in a minority of cases, have much different risk factors associated with them and as such have been studied with great care. The first risk factor is diabetes mellitus. Patients with this disease, which is a failure to use or produce insulin, have been found to have a much higher risk for pancreatic cancer than those without; up to 2.6 times more likely. (Hassan et al., 2007) However, it has also been reported that new onset diabetes may actually be caused by early pancreatic cancer (Pannala, Basu, Petersen, & Chari, 2009). Insulin is produced within the pancreas, and it is not uncommon for insulin-producing cells to be affected by the carcinoma. Pannala, Basu, Ptersen, and Chari suggest that it can be used as a type of screening for asymptomatic pancreatic cancer (Pannala et al, 2009).

2.42 Alcohol Consumption

Another risk factor associated with pancreatic cancer is heavy drinking, specifically of hard liquor. In a study done by the University of Texas, it was found that men who had a longer lifetime of drinking (>60 ml ethanol/day) were more likely to develop pancreatic cancer than those who did not drink by almost 60%. Women were included in this study but the significant risk was only observed in males and not females. It was also noted in this study , the pancreatic cancer patients had consumed nearly 60,000 more milliliters of ethanol over their lifetime when compared to subjects without pancreatic cancer (Hassan et al., 2007).

2.43 Smoking

Smoking is another risk factor that is associated with a nearly 60% increase in risk for pancreatic cancer. In the same study done by the University of Texas, those who had smoked a cigarette ever in their lifetimes were at elevated risk, while those who had smoked over 20 packs a year were at an even greater risk for pancreatic cancer. This correlation, unlike with the drinking, was observed more in women than in men (Hassan et al., 2007). This raises the question of whether or not second hand smoke has an impact on the development of pancreatic cancer. In another study done in the San Francisco area, the correlation between second hand smoke exposure and pancreatic cancer studied, and it showed no increase in risk for pancreatic cancer development. This would suggest that there is something within the cigarette itself that is not present in the smoke that is exhaled from a smoker that is responsible for the additional risk to a smoker (Hassan et al., 2007).

2.44 Chronic Pancreatitis

Yet another risk factor for pancreatic cancer is chronic pancreatitis. This is an inflammation of the pancreas and it can cause irregular hormone function if it blocks or

swells the exocrine duct. An 83.3% of pancreatic cancer incidence coincided with pancreatitis within two years of being diagnosed with pancreatitis. This is a very high correlation, however it is worthy to mention that pancreatitis itself is also caused by the same risk factors as pancreatic cancer (Hassan et al., 2007).

2.45 Blood Type

A study performed by Wolpin et. al at the Dana-Farber Cancer Institute shows that there is a correlation between blood type and development of pancreatic cancer. This study was performed on 927, 995 people and out of this number, 316 developed pancreatic cancer. Of these 316, it was discovered that having an A, B, or AB blood type group raises your risk of pancreatic cancer by 17% (2009).

2.46 Age

Age is another risk factor, though not quite as indicative as other factors. Pancreatic cancer has been diagnosed in men and women of all ages, but has been found most commonly in men and women over 45, with increased diagnosis over the age of 60 (Brunner & Smeltzer, 2010). This is also backed up by a study done by Brune et al. (2010)

2.47 Risk synergy

Also of note is the synergy between certain risk factors. Smoking and diabetes mellitus, and smoking and family history had the highest correlation to pancreatic cancer incidences. The joint effect of smoking and either risk factor seems to be additive, making a person who has both of these risk factors at a much higher risk to develop some form of pancreatic cancer (Hassan et al., 2007).

2.5 Screening For Pancreatic Cancer

With all of these risk factors associated with pancreatic cancer, it seems a simple matter to screen patients for pancreatic cancer. However, this is not the case with most risk factors with the exceptions of a genetic link to pancreatic cancer and new-onset diabetes (Pannala et al, 2009). It cannot be screened in all patients because it is not cost effective. The reason for this is that pancreatic cancer develops in such few individuals that screening the entire population for pancreatic cancer would be extremely ineffective. This is because the only way of detecting pancreatic cancer early is by using more invasive methods than those within a routine checkup. This includes an endoscopic sonogram, which is one of the only effective ways to detect precursor lesions in the pancreas. Endoscopy is a term used to refer to an instrument being inserted into the body, whether it is a camera or a sonogram machine. Cross-sectional imaging of the pancreas often reveals nothing until it is classified as a large type, which by then it is usually incurable (Chari, 2007).

For these reasons, screening should be done on those with the highest risk of developing the disease. The highest risk patients are those with multiple family members affected by pancreatic cancer. This could mean a germ line mutation and as such could put the person at the highest risk for developing the disease. Other genetic diseases, such as Peutz-Jeghers syndrome, HNPCC (a gene associated with colon cancer), or FAMMM (a gene associated with melanoma) also represent high risk cases due to the nature of the disease. In the case of HNPCC, cancers of multiple organs are associated with this disease, and in the case of FAMMM, a mutation associated with the multiple melanomas it creates is also suspected in having a role in the development of pancreatic cancer. This unfortunately means that most sporadic cases will never be found until well after they have advanced to stage IV and are nearly untreatable. Since pancreatic cancer effects so few people; 9 out of every 100,000 (Chari, 2007), it is not cost effective to screen those without a very high risk factor for the disease. In order to make it viable, 16% or more of the population would have to sporadically develop the disease.

2.6 Non-Invasive Testing

Radiological testing is also used to screen for pancreatic cancer. Primarily CT scans are used because tests such as MRIs are relatively ineffective in the detection of pancreatic lesions. CT scans are preferred as they are continuous x-ray scans, the most effective of which is the 360 CT scan, which circles a patient 360 degrees and continuously takes x-rays. As previously mentioned, most lesions do not appear on conventional CT scans. However, newer CT scanners have greater resolutions and have much thinner slicing thickness, allowing for greater detection of tumors. As of 2007 the multi-detector CT scanners have only been used for lung cancer, and the effectiveness in terms of pancreatic cancer remains to be established (Chari, 2007)

With a study published only recently, another form of non-invasive testing may gain new ground into testing for pancreatic cancer. This test is based on the correlation between mast cells and pancreatic cancer, with a higher mast cell count directly correlating with an increasing severity in pancreatic cancer. Mast cells are typically associated with an allergic reaction as they contain and release histamines, but are also associated with wound healing and pathogen blocking. While mast cell activity is considered a generalized response to a variety of pathogens or allergies, it may be useful as a screening tool. Since mast cell count directly correlated with severity of pancreatic cancer in patients tested, an increased mast cell count could give an early warning to pancreatic cancer. While providing screening for pancreatic cancer may still not be feasible due to its low rate of occurrence, a reliable non-evasive test is certainly a step in the right direction. More testing will be necessary to provide data on the efficacy of the test (Strouch et al., 2010).

2.7 Invasive Testing

There have been successful invasive tests that have been used to detect pancreatic cancer. One method is endoscopic ultrasound, which uses sound waves rather than other forms of radiation. Endoscopic ultrasounds involve placing a tube with an ultrasound signal transducer in the upper or lower GI tract via the mouth or anus. This is far more effective than a normal ultrasound because the signal transducer is on the end of the tube, allowing for a much higher resolution image. However, the field of vision is much narrower and the patient needs to be sedated in order to receive the test. This method has been proven and it has been used to find pancreatic adenocarcinoma (Chari, 2007).

Taking this one step further is endoscopic ultrasound fine needle aspiration or EUS-FNA. Fine needle aspiration is a procedure involving a fine needle injected beneath tissue in order to obtain a sample of another tissue. Prior to EUS-FNA,

FNA was used to obtain samples of lesions just beneath the epidermal layer so that a tumor could be studied without undergoing unnecessary removal of the tumor. This technology has been applied to EUS. Using the endoscopic ultrasound, a needle is placed on the end which can then infiltrate the pancreas via the GI tract and sample cells can be removed from any observed tumors. This greatly aids in diagnosing and staging the pancreatic cancer because the cancerous cells can be examined microscopically. It has been found in a study done in the Czech Republic that the accuracy rating of this test is 92%. Despite this advance in medical technology, the relatively low occurrence of pancreatic cancer still impedes its use in screening of patients other than those who are at high risk (Kliment et al., 2010).

2.8 Patient Awareness

Pancreatic cancer lacks specific symptoms until late in the disease and is therefore difficult to diagnose early using sub-clinical diagnosis. There are warning signs for pancreatic adenocarcinoma that a person can be aware of in order to raise his or her knowledge of the disease. One such symptom is general pain in the abdominal region or upper and middle back pain. The abdominal pain arises from the same area of the pancreas, but the back pain is a referred pain symptom. Very sudden weight loss is another potential sign of pancreatic cancer as well all types of cancer, especially in the latest stages of development. Darker urine and clay-colored stool can also be sub-clinical manifestation of pancreatic cancer (Brunner & Smeltzer, 2010). Another symptom of pancreatic cancer that may manifest itself is back pain that is relieved by sitting up. It is not known why this occurs but it has been seen in a clinical setting (Frederick Alden, personal communication). Another possible symptom is an unexpected diagnosis of diabetes (Pannala et al, 2009).

A patient should see a doctor for any of these symptoms individually as many can be indicative of other diseases. Experiencing these symptoms in conjunction with a family history, smoking, or heavy drinking, or experiencing multiple symptoms, should result in immediate contact of a physician. Pancreatic cancer, if caught early enough, is curable. It is only because of its asymptomatic nature that it is difficult to diagnose prior to stage IV.

2.9 Raising awareness and How It Helps

Pancreatic cancer affects a relatively small amount of the United States population, yet it is the fourth leading cause of cancer related death in America. Other cancers, which have a much higher incidence rating, have had much more media and public attention in an effort to help the prognosis of the disease. And indeed, breast (Shalini, Varghese, & Nayak, 2011), testicular (Trumbo, 2004), and even lung (Dutton, 2011) cancer survival rates have increased. If the same treatment could be given to pancreatic cancer, the pancreatic cancer death rate could be sharply reduced, and the five year survival rate improved to match or exceed that of other cancers.

3. Conclusion

Pancreatic cancer is one of the deadliest cancers in the world, killing nearly 35,000 people in America every year. It is a disease that has dismal survivability, mostly due to very poor early diagnosis. It is through awareness of the risk factors and early signs and symptoms that improved detection and early treatment can be achieved. Pancreatic cancer develops largely in those who are genetically predisposed to it and therefore it is imperative that people are aware of their genetic history in order to receive early screening. Similarly, those without a genetic background need to be aware of the general signs and symptoms, as having multiple symptoms can lead to an early diagnosis.

It has been shown in this paper that knowledge and awareness of risk factors, signs and sumptoms can lead to early cancer diagnoses allowing for improved treatment. With pancreatic cancer especially, early diagnosis is key since resection of the cancer is the only proven method to eradicate the cancer completely. If a pancreatic cancer tumor can be caught before the desmoplastic reaction (~3mm in size), the chances for survival greatly increase. A desmoplastic reaction, or desmoplasia, is a growth of fibrous connective tissue around a tumor and into the surrounding organs. Therefore, educating patients as well as physicians on the signs and symptoms of early pancreatic cancer is necessary in order to increase prognosis of the disease.

Pancreatic cancer kills a disproportionately large number of people of those that are diagnosed, and as such research is being done in order to find more effective treatments for fighting this disease. Resection in tandem with other drugs such as gemcitabine and more notably nelfinavir is the only treatment to work effectively known today. The ability of clinicians to resect pancreatic cancer has increased, and in some cases can lead to complete eradication of the disease. As a result, it is the responsibility of the clinician to identify the best course of treatment for a person afflicted with this disease. Awareness of all possible treatments as well as early warning signs can contribue a much higher chance of survival.

In conclusion, it can be said that pancreatic cancer is a very aggressive and malignant disease, killing almost all those that it presents itself in. While it affects only 0.6% of the American population, those that do develop pancreatic cancer find themselves with little hope due to the fact that it is very rarely found earlier than stage IV. However, there is still a chance to find it early if the general signs and symptoms are reported. Since screening the entire population is a poor method of diagnosis because of the lack of biological markers. It can only be through increased awareness of pancreatic cancer and through increased public education of the symptoms that anything can truly be done about its poor diagnosis. It is the hope that through this paper and other campaigns that awareness of pancreatic cancer will be improved and the success rate of pancreatic cancer treatments will increase. Once awareness causes more patients to seek diagnosis and treament for the disease in an earlier stage, leading to more survivors, these success stories can be publicized. With this factor working in tandem with other campaigns, it is hoped that the survival rate can be raised, offering a ray of hope for those afflicted by this disproportionately deadly cancer.

References

Brune, K. A., Lau, B., Palmisano, E., Canto, M., Goggins, M. G., Hruban, R. H., & Klein, A. P. (2010). Importance of Age of Onset in Pancreatic Cancer Kindreds. *JNCI Journal of the National Cancer Institute*, *102*(2), 119-126. doi: 10.1093/jnci/djp466

Brunner, L. S., & Smeltzer, S. C. (2010). *Brunner & Suddarth's textbook of medical-surgical nursing.* Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins.

Candefjord, S., Ramser, K., & Lindahl, O. A. (2009). Technologies for localization and diagnosis of prostate cancer. *Journal of Medical Engineering & Technology*, *33*(8), 585-603. . Retrieved November 24, 2011, from http://web.ebscohost.com doi: 10.3109/03091900903111966

Chari, S. T. (2007). Detecting early pancreatic cancer-problems and prospects. *Semin Oncol*, *34*(4), 284-294. Retrieved October 26, 2011, from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2680914/?tool=pmcentrez

Dutton, A. (2011). Lung cancer poster campaign sees diagnoses rocket. *Cancer Nursing Practice*, *10*(2), 4. Retrieved November 28, 2011, from http://www.cinahl.com/cgi-bin/refsvc?jid=3148&accno=2010971515

Hassan, M. M., Bondy, M. L., Wolff, R. A., Abbruzzese, J. L., Vauthey, J., Pisters, P. W., ... Li, D. (2007). Risk Factors for Pancreatic Cancer: Case-Control Study. *The American Journal of Gastroenterology*, *102*(12), 2696-2707. doi: 10.1111/j.1572-0241.2007.01510.x

Kliment, M., Urban, O., Cegan, M., Fojtik, P., Falt, P., Dvorackova, J., ... Jaluvka, F. (2010). Endoscopic ultrasound-guided fine needle aspiration of pancreatic masses: The utility and impact on management of patients. *Scandinavian Journal of Gastroenterology*, *45*(11), 1372-1379. doi: 10.3109/00365521.2010.503966

Maitra, A., & Hruban, R. H. (2008). Pancreatic Cancer. *Annual Review of Pathology: Mechanisms of Disease*, 3(1), 157-188. doi: 10.1146/annurev.pathmechdis.3.121806.154305

Pannala, R., Basu, A., Petersen, G., & Chari, S. (2009). New-onset diabetes: A potential clue to the early diagnosis of pancreatic cancer. *The Lancet Oncology*, *10*(1), 88-95. doi: 10.1016/S1470-2045(08)70337-1

Shalini, Varghese, D., & Nayak, M. (2011). Awareness and impact of education on breast self examination among college going girls. *Indian Journal of Palliative Care*, *17*(2), 150-154. Retrieved December 6, 2011, from http://http://web.ebscohost.com

Strouch, M. J., Cheon, E. C., Salabat, M. R., Krantz, S. B., Gounaris, E., Melstrom, L. G., ... Bentrem, D. J. (2010). Crosstalk between Mast Cells and Pancreatic Cancer Cells Contributes to Pancreatic Tumor Progression. *Clinical Cancer Research*, *16*(8), 2257-2265. doi: 10.1158/1078-0432.CCR-09-1230

Trumbo, C. W. (2004). Mass-mediated information effects on testicular self-examination among college students. *Journal of American College Health*, *52*(6), 257-262. Retrieved December 6, 2011, from http://web.ebscohost.com doi: 10.3200/JACH.52.6.257-262

Wolpin, B. M., Chan, A. T., Hartge, P., Chanock, S. J., Kraft, P., Hunter, D. J., ... Fuchs, C. S. (2009). ABO Blood Group and the Risk of Pancreatic Cancer. *JNCI Journal of the National Cancer Institute*, *101*(6), 424-431. doi: 10.1093/jnci/djp020