

Surgery and Chronic Stress// Ultimately Leading to Major Health Risks

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Abstract

This article reflects how surgery irrespective to age and/or organ become a prospective major health problem. In general about 50-60% patient's undergone surgery suffer mild/moderate/severe psychobiological illness in future for a long time due to feeling of fear that he/she (1:3) has lost part of his body, inside unhealed or prolonged healing process. So some neuro-psychiatric symptoms such as anxiety, tension, emotion and depression gradually burden their daily life style eventually leading to chronic stress (about 10%) along with some major health risks in 4-6 years after surgery.

Background

Now-a-days strokes and heart diseases are increasing in prevalence every year and show no sign of slowing (American Heart Association 2015 A). While it is true that one of the risk factors associated with CVD and Heart Diseases is known as **chronic stress**. So it is alarming that patients of chronic stress are increasing in daily practice. Day by day this is becoming serious to which we should pay attention. The main causes of chronic stress are arising from bad socio-economic condition and impact of surgery. I have a study relating surgical cases which is controllable giving importance at early stage of the disease and also before surgery and post surgical visits.

Brief summary of the study

This is an observational, prospective and multi centred study under intention to treat principle. This study is a over-view about the patients from January'08 to July'14. Data was collected from the leading practitioners of a district named Khulna in Bangladesh. The practitioners are Medicinist, Gynaecologist, Orthopaedician, Eye Surgeon, General Surgeon, Psychiatrist and Neurologist. In this study the outcome shows that about 10% of post surgical (mainly those who were undergone major surgery) had been suffering from chronic stress and among them some patient's experienced major health risks i.e. Hypertension, Diabetes, Stroke, Heart attack, Panic disorder, Generalised Anxiety Disorder etc.

Method

The randomly selected samples were taken from the available data in practitioners' personal computer. From two Medicinists 58 (30+28) of chronic stress patients were selected. Among them 45 patients were post surgical of different age group and underwent somewhat major or minor surgeries. 5 were undergone Appendicectomy at the age of 6 to 8 yrs. Now they are 10 to 12 yrs old who were settled after treatment at the preliminary stage. 33 patients were undergone Total Abdominal Hysterectomy. The most of them responded well at follow up treatment from acute state of stress. 5 patients became sufferers of chronic stress in 4 yrs after surgery. 10 patients were dropped out after 1 yr of treatment. So they are excluded

from this study. Among those 5 patients, 1 experienced stroke after 1 yr and another died from heart attack.

83 patients of various age groups were selected from Surgeon's data. All of them were undergone major or minor surgery. 23 of them were teen ager. Two of teen age group became chronically stressed at the age of 18 yrs and were referred to Psychiatrist. These patients were found out from the Psychiatrists' data and the outcome was that they did not cure in treatment. Among the adult ones (60) those were undergone major surgery 5 patients had been facing symptoms of chronic stress and finally they remained in the stressed state. But rest of them were treated well in course of time.

151 patients were taken in account from the data found in Gynaecologist's p.c. 131 of them were undergone Total Abdominal Hysterectomy (TAH). The TAH patients taken from the Medicinists are not included in this number of patients. 15 patients were of Lower Uterine Ceasarian Section (LUCS) and 5 were of resection of fibroid uterus. No problem was for the patients of LUCS in follow up treatment but 1 of the fibroid uterus patients and 15 of TAH patients suffered long time psychological problem. After 3 yrs of treatment they were referred to Neuro-Psychiatrists. After two yrs treatment 2 of them were a bit well, but 13 patients had been suffering from chronic stress of those 3 died from heart attack and 2 faced stroke. Some of them experienced Diabetes, GAD etc.

23 patients (10 male and 13 female) were included in this study coming from Orthopaedician's data. All were undergone ORIF (Open Reduction & Internal Fixation) for lower limb bone fracture. Nails and plates were kept *in situ*. Among them 3 (1 male 2 female) were suffering from chronic stress those who were referred to Neurologist after two yrs of follow up treatment. Seven were dropped out and found no trace at their address possibly due to shifting their working place. So no concrete outcome is found here and here is the gap of this study.

Three patients were included from the Ophthalmologist who had been done cataract operation and after 3 follow up visit they were fine.

Most of the patients of this study were taken from the data of Psychiatrist and Neurologist. 215 (115 + 100) samples were taken from two Psychiatrists. The patients were of different ages. 85 and 69 were post

surgical patients. 15 and 13 patients undergone minor (Appendectomy) surgery at the age of 8 to 12 years. During the study they passed 4 yrs of age more. Among them 2 were of chronic stress patients. Other covariates for them were social and family events. They experienced paternal exposure to maternal stress. So it cannot be concluded that they had been suffering from chronic stress only due to surgery and this is a weak point of the study. Rest of the patients undergone major surgery. 60 and 36 had operation named cholecystectomy and others were of mastectomy, gastrojejunostomy etc. The patients who were undergone major surgery had been suffering from acute or chronic stress. Age group was 30 to 60 yrs. 5 patients experienced mastectomy and 3 of them suffered from chronic stress in four yrs after surgery. 5 and 3 of the patients who were done cholecystectomy had been suffering from chronic stress among which 2 died from haemorrhagic stroke after 5 yrs of surgery. The patients other than post surgery who had been suffering from chronic stress experienced other causes of chronic stress. The post-surgical samples are out of the samples taken from surgeon's data.

From my (Neurologist) data I selected 200 post surgical patients who are also not included in the samples mentioned above, of different age group. This group of patients merged with others (beginning from 2008) in 2010. 100 patients were undergone appendectomy at the age of 8 to 11 yrs. During this study they were 12 to 15 yrs old. Other patients were adult. 50 were of 20 to 40 yrs age group and the rest of the samples were 41 to 60 yrs age group. All the adult patients were undergone major surgery. They got follow up visits for 2 yrs to the Surgeons. Then they were referred to me. About 8 patients of appendectomy (12 to 15 yrs age group) faced chronic stress. Of course there had some other covariates i.e. poverty, social and environmental causes, child abuse etc. in every case. So it can be said that surgery is not the only cause of their stress. Here is the weak point of the study. 7 of the age group 20 to 40 yrs suffered chronic stress in 4 yrs after surgery and 11 of the age group 41 to 60 yrs had been suffering from chronic stress in 3 yrs after surgery. Among these 11 patients 2 had experience of heart attack and 3 faced stroke after 5 yrs of surgery.

Result

672 patients/samples were taken in account in the study from different source of data. Among them 659 patients was post surgical. 62 patients had been suffering from chronic stress in 4-6 yrs after surgery. And among them (mainly adult group) 15 patients experienced secondary health risk like stroke and heart attack the cause of which arising from their chronic stress.

Subjective analysis

Stress is the body's method of reaction to a challenge by fight-or-flight response (here sympathetic nervous system is activated) of an organism to stressors (such as an environmental condition) or a stimulus/sensitivity which affects a person's mental and physical well-being.

In our body biological processes strive to maintain equilibrium (homeostasis), a steady state that exists more as an ideal (optimum condition of living) and less as an achievable condition (adaptive). Factors (environmental, external and internal stimuli) causing an organism's condition to diverge too far from homeostasis can be experienced as stress. A lion share of patients undergone surgery/major physical trauma could be faced greatly disrupted homeostasis. On the other hand, an organism's attempt at restoring conditions back to or near homeostasis often consuming energy and natural resources can also be interpreted as stress. In such a state an organ's fight-or-flight response (SNS stimulation) recruits the body's energy and focuses attention to overcome the challenge at hand. In this way body may be cachaexic.

Stress can have many profound effects on human psychobiological sensory system operations. CNS also plays a crucial role in the body's

stress related mechanism which works closely with endocrine system to regulate stress mechanism. Physiological stress represents a wide range of physical responses that occur as a direct effect of a stress or causing of upset in the homeostasis of the body. Upon immediate disruption of either psychological or physiological equilibrium the body responds by stimulating nervous, endocrine & immune systems. The reaction of these systems causes a number of physical changes that has both short and long term effects on the body [1].

As of 2011 Neuroscientists such as Bruce McEwen and Jaap Koohaas believe that stress based on years of empirical research should be restricted to conditions where an environmental demand exceeds the natural regulatory capacity of an organism [2]. Stress- fight-or-flight response- CNS activation- organ adaptation to environment by following ways:

The brain: Plays a critical role in the body's perception and response to stress [3]. However pinpointing exactly which region of the brain is particularly responsible for specific aspect of a stress response is difficult to distinguish and often unclear. It is the blindness of this article. Understanding that the brain works as a network like fashion carrying information about a stressful situation across regions of the brain (from cortical sensory areas to more basal structures & vice versa) can help explain how stress and its negative consequences are heavily rooted in neural communicative dysfunction. In spite of, the several important brain structures implicated in playing key roles in stress pathways are as below:

Hypothalamus: Secretes various hormones namely corticotrophin releasing hormones which stimulates body's pituitary gland and initiates a heavily regulated stress response pathway [4]. Amygdala is thought to play role in processing emotion and stress mechanism particularly when feeling of anxiety and fear are involved [5]

Hippocampus: It is responsible for cognitive function is damaged by chronic stress [6]. Prefrontal cortex responsible for attention and problem solution becomes impaired during the stress response [7].

Locus coeruleus and Raphe nucleus: It become active and synthesize neurotransmitters like nor epinephrine (causes fight-or-flight response), serotonin (mood regulator when stress by depression and anxiety). **Neuropeptide Y** a protein synthesized in Hypothalamus acts as a chemical messenger in brain which play role in appetite, feeding behaviour and satiety.

The spinal cord: Plays a critical role in transferring stress response neural impulses from the brain to the rest of the body. In addition to the neuro-endocrine blood hormone signalling system initiated by the hypothalamus, the spinal cord communicates rest of the body by innervating the peripheral nervous system. Certain nerves that belong to the sympathetic branch of the central nervous system exit the spinal cord & stimulate peripheral nerves which in turn engage the body's major organs and muscles in a fight-or-flight manner.

What is chronic stress?

Chronic stress is defined as a state of prolonged tension from internal and/or external stressors which may cause various physical manifestations i.e. asthma, hypertension, diabetes, irritable bowel syndrome, ulcer, suppression of immune system, generalised anxiety disorder, panic disorder, phobia, generalised adaptation syndrome & depression. Chronic stress takes a more significant toll on our body than acute stress does. It can raise blood pressure, increase the risk of heart attack and stroke, increase vulnerability to anxiety & depression, contribute to infertility and hastens aging process. Chronic stress in older & unhealthy individuals may have long term effects those are detrimental to health [8].

Symptoms of chronic stress:
Physical:

- Loss of sex drive
- Irregular period
- Frequent cold
- Aches & pains
- Increased frequency of urination
- Diarrhoea or constipation
- Indigestion
- Change in blood glucose
- Nausea, dizziness
- Chest pain, rapid heart beat

Behavioural symptoms:

- Sleeping too much or too little
- Isolating oneself from others
- Eating more or less
- Procrastinating or neglecting responsibilities
- Using alcohol, cigarettes or drugs to relax
- Nervous habit (i.e. nail biting, pacing)

Cognitive symptoms:

- Inability to concentrate
- Anxious or racing thought
- Constant worrying
- Memory problem
- Poor judgement
- Pessimistic approach or thoughts

Emotional symptoms:

- Feeling overwhelmed
- Moodiness
- Irritability or short temper
- Agitation, inability to relax
- Depression or general unhappiness
- Sense of loneliness and isolation

Other covariates of chronic stress

Social issues i.e. struggle with specific social defeat, relationship conflict, deception, breaks-up, unwanted birth, death, disliked marriage, divorce, poverty, unemployment, clinical depression, obsessive compulsive disorder, heavy drinking, insufficient sleep, exam, sexual abuse [9], adverse experiences during development (e.g. paternal exposure to maternal stress) [10], working under bad boss etc.

Mechanism of chronic stress

Studies revealing the relationship between the immune system and the central nervous system indicate that the stress can alter the function of the white blood cells involved in immune function known as lymphocytes & macrophages.

People undergone stressful life events such as marital turmoil or bereavement have a weaker lymphoproliferation response. People in distress marriages have also been shown to have greater decreases in cellular immunity functioning overtime when compared to those in happier marriages [11]. After antigens initiate an immune response, these WBCs send signals composed of cytokines & other hormonal proteins to the brain and neuro-endocrine system [12].

The immune system plays also a role in stress & early stages of wound healing. It is responsible for preparing the tissues for repairing and promoting recruitment of certain cells to the wound areas [13] consistent with the fact that stress alters the production of cytokines. Chronic stress associated with care giving for a person with Alzheimer's disease leads to delayed wound healing. Results indicated that biopsy of wound healed 25% slowly in the chronically stressed group or those caring for a person with Alzheimer's disease [14]. Chronic stress has also been shown to impair developmental growth in children by lowering the pituitary glands production of growth hormone as in children associated with a home environment involving serious marital discord, alcoholism and child abuse [15]. Chronic stress is seen to affect the part of the brain where memories are processed through & stored. Stress releases cortisol. cortisol causes metabolic activity throughout the body which raises the activity of the hippocampus. Overstimulation of hippocampus & the toxins then are more likely to kill or damage neurones in the hippocampus [16].

Neurochemistry has a great role in stress mechanism. Here some hormones regulate the effect of stress responses. The hypo pituitary adrenal axis is a multistep biochemical pathway where information is transmitted from one area of the body to the next via chemical messengers like nor epinephrine, serotonin, peptides etc. Each step in this pathway not only passes information along to stimulate the next region but also receives feedback from messengers produced later in the pathway to either enhance or suppress earlier steps in the pathway.

Effect of stress on the immune system

Stress in the body's reaction to any stimulus that disturbs its equilibrium. When the equilibrium of various hormones is altered, the effect of these changes can be detrimental to the immune system [17]. Much research has shown that stress has a negative effect on the immune system mostly through studies where participants were subjected to a variety of viruses. In one study individuals caring for a spouse with dementia representing the stress group saw a significant decrease in immune response when given an influenza virus vaccine compared to a non stressed control group [15]. A similar study was conducted using a respiratory virus. Participants were infected with the virus given a stress index. Result showed that an increase in score of the stress index correlated with a greater severity of cold symptoms [18]. Studies with HIV also have shown stress to speed up viral progression. Men with HIV (Human Immunodeficiency Virus) were two to three times more likely to develop AIDS (Acquired Immune Deficiency Syndrome) when under above average stress [15].

The immune system protects the body from viruses, bacteria & any other thing that is different or that the body can't recognize as of itself. The immune system sees them as intruders and sends message to attack. The WBCs i.e. leukocytes are very important to the immune system [15]. WBCs are different types of cells including B cells, T cells & natural killer cells. B cells secrete antibody, T cells attack intruders & natural killer cells attack cells those have been infected by germs. These leukocytes produce cytokines which fight against infections [19]. But these also are the immune system communicators in telling the brain that the body is ill. When an individual is stressed on going through stressful experience, the immune system starts to produce natural killer cells and cytokines [17]. When levels of cytokines are higher they combat infections & therefore the brain gets communicated that the body is ill and it produces symptoms as if the individual was ill. These symptoms include fever, sleepiness, lack of energy, no appetite and basically flu like symptoms. These symptoms mean the body is fighting against illness or germs [17]. This is useful when the body goes through the stress from an injury. But the body has now evolved to do this process during stressful events such as taking exams, or even going through a life changing events such as death of a family

member or a divorce [17]. That is why many times when individuals are stressed because of life changing events or situations such as those, they get these symptoms & believe they are sick when in reality it can be because the body is under stress [17].

The most important aspect of the immune system are T-cells found in the form of T-helper and T-suppressor cells. Cortisol once released in the blood stream (stressed-chemical messengers-hypothalamus stimulation-release of CRH (Corticotrophin Releasing Hormone)-Anterior pituitary activation- release of ACTH (Adreno-corticotrophin hormone)-adrenal cortex stimulation- release of cortisol) immediately begins to cause division of T-suppressor cells. This rapid division of T-suppressor cells increases the nos. of the same causing diminished immunity eventually leading the body more prone to infections and vulnerable to diseases. For example, students who are taking exams show weaker immune responses if they also report stress due to daily hassles [17]. On study shows that individuals who reported relationship conflict lasting more than three months have a great risk of developing illness and slower wound healing.

Now we can see how post surgical stress (if any) harms our body in some ways as below:

Surgery: anxiety, tension, emotion, fear, depression, insomnia etc. for long time-chronic stress-decrease memory, inhibit development, weaker immunity- some physical condition like asthma, back pain, arrhythmia, fatigue, headache, HTN(Hypertension), heart attack, stroke, DM (Diabetes Mellitus), IBS (Irritable Bowel Syndrome), hastened aging process and so on.

Coping

So steps should be taken as follows:

Counselling: Counselling is very important what every surgeon should take measures about counselling to the pts before and after surgery. Before and after surgery-Reassurance and psychotherapy.

Medical treatment: SSRI (Selective Serotonin Reuptake Inhibitor) and NSRI (Nor epinephrine and Serotonin Reuptake Inhibitor) are the drugs of choice [19].

- 1st line treatment: Flupentixol and melitracin in conventional doses up to 6-12 m with clonazepam according to severity for same duration.
- 2nd line treatment: Mirtazepine 15 mg-30 mg bid in divided doses
- Other symptomatic treatment

For the covariates i.e. change of life, socioeconomic condition, stressful life events such as marital turmoil or bereavement, poverty etc. there are several ways of coping with stress such as controlling the source of stress [20] or learning to set limits and to say 'no' to some of the unlike demands that bosses or family members may make, thinking about another topic and listening music, go out with friends. Do the things one likes i.e. exercise, do breathing routinely. Having support from a beloved one also helps a lot in reducing stress [17].

Critics

This study is done taking data from a part of the practitioners of a district (one of sixty four) of Bangladesh. So sample size is very small & accurate outcome may not be the same as that of the study in case of larger samples.

About 25% of total population of Bangladesh are under the level of poverty. So they can't meet the medical expenses they need. Thereby they are not getting proper treatment as they are unable always to follow the doctors' advice for attending the places set for full chain (multidisciplinary team) of treatment. In relation to the global aspect this scenario may be different as the people of developed countries have access to full probable

& possible facilities of health service provided by the government and private sector.

Some patients of 2008 merged in the study in 2010. Data taken from medicinists, gynaecologist, general surgeons, orthopaedician, eye surgeon, and psychiatrist begins in January 2008 but data from neurologist starts in January 2010. So there may be slight variation in the outcome/result. There are some gaps & week points of the study which are mentioned in the description at the places where they belong to. All confiding factors (covariates) causing chronic stress other than surgery are not taken into account in this study. If they were taken in consideration the outcome of the study might be varied.

Conclusion/Proposal

About 10% of post surgical patients suffer from chronic stress which ultimately causes major health risks and abortive death of about 25% chronically stressed patients. On one hand, these stressed patients are becoming burden of the family & creating a bad impact on economy. But on other hand, if they can avail proper counselling and treatment we can save many lives and the can provide a positive contribution to economy. To ensure proper management we need a big budget. But the government of developing and populous countries can't provide this sort of budget in health sector. So contribution of rich men of a country and donation from developed countries can control many major health risks and premature deaths every year of developing countries like Bangladesh and others.

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