

Research Article

Medical and Dental 3D Printing.

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Introduction

Integrative oncology, the originally conceptualized diagnosis-specific field of integrative medicine is today more comprehensive, it used to address a palliative control with non-pharmacologic therapies. Commonly referred to as “complementary therapies”, abbreviated by dropping the concept of „alternate“ therapies. The concept is holistic but relies more on sound scientific foundation which the „alternative“ medicines lacked.

Integrative oncology encompasses the following concepts: 1. The use of evidence-based adjuncts to mainstream care 2. Effective control of physical and emotional issues, 3. Enhance physical abilities post treatment, 4. Emotional and Psychological strength by life style improvements, 5. Provide patients with skills enabling them to help themselves throughout and following mainstream cancer treatment.

Integrative or complementary therapies are predominantly rational and noninvasive. The previous use of acronym “CAM,” for “complementary and alternative therapies,” confuses the issue and does a substantial disservice to patients and medical professionals due to the inclusive use of alternate therapies which were unsubstantiated by research. On the other hand, complementary and integrative modalities have demonstrated safety value and benefits.

Complementary therapies used in conjunction with mainstream oncology care are termed as “Integrative Oncology”. The all-encompassing care addressing patients’ physical, psychological and spiritual needs constitutes the practice of integrative oncology. By recommending predominantly non-invasive modalities that reduce symptom burden and improve quality of life, enable patients to play a role in their care. Critical for most patients, this also improves the physician-patient relationship, the quality of cancer care, and the well-being of patients and their families [1].

‘Integrative oncology’ is a patient-centered, evidence-informed field of cancer care that utilizes mind and body practices, natural products, and/or lifestyle modifications from different traditions alongside conventional cancer treatments. Integrative oncology aims to optimize health, quality of life, and clinical outcomes across the cancer care continuum and to empower people to prevent cancer and become active participants before, during, and beyond cancer treatment” [2]. 3 D Printing (3DP), a new innovative approach, undertakes the preparation of body replicas of the internal physical changes in various disease process including Oncology. The process uses the raw Dicom data of the 3 D Scans like CT, MRI, 3D USG and Dental CBCT, to convert into 3 dimensional models of the body sections for an ‘out of body and seeing the unseen’ experience, hitherto not possible or available. For patients’ and doctors’ emotional and physical needs there is a strong lacuna in our ability to: 1. Convince patients that they have the disease., 2. Prepare patients for the inevitability of the treatment process., 3. Get wholehearted or adequate compliance to accept the treatment., 4. Reduce Doctors’ stress and guide towards precision in surgery., 5. Plan and manage

reconstructive and rehabilitative procedures to give quality of life.

Informed Consent:

The first three points are related to informed consent. Normally the so-called signing of the document is actually ‘consent form’. Patients do not understand Scan Images, Radiographs or Laboratory findings, so it is not ‘informed’ consent. 3 D printing gives better chances in getting closer to ‘informed’ consent. 3 D Printing gives better modality as it. Figure 1,2.

The 3DP models can be made for any region of the body, from your 3D/4D scans. These models can be used to get informed consent-evidence based, kept as proof so they can be evidence of proper protocol in Insurance or Medico-Legal cases. They also give the patients Quality Assurance because of their higher understanding and promotes acceptance of treatment, compliance and stress breaking for both patients and doctors.

Stress Breaking Through Better Understanding

3DP models show lesions in much better way the 3DScans. This allows the doctor to be better mentally prepared for the treatment execution. Figure 3.

shows „the unseen“, and brings your organs and tissues out of the body for better explanation.



Figure 1: For Example the patients’ heart in 3DP model could be full and cut. The heart could be stacked for patient to understand the whole and parts. Any lesions, valvular defects, infarction could be shown. The complications which could arise by proximity of blood vessels can be understood by the patient.



Figure 2: A 2D Radiograph will only say Pneumonia present but 2DP will show which type. Furthermore the entire lung architecture can be shown and any disease related damage could be seen. The loss of vital capacity can be explained. If one combines with Artificial Intelligence, a virtual tour of lungs architecture can be given to patient.

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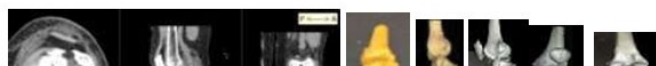


Figure 3: The 3D Scan clearly shows the fracture but the 3DP models is more clearly showing the fracture, displacement. The model can be turned to see from allsides, the small chipped bone at the joint area is also clear as compared to the scan. Further muscles and blood vessels can also be shown for mock surgery.

Visibility

3DP Models show better visibility and assists in complete removal with clear prediction of what will be encountered during surgery. Figure 4. Two cases wherein mandibular resection can be avoided. In the first case 'in toto' removal is possible, in the second a lot of oedema is present and the removal will be in bits of tissues. Figure 5,6.

Tumour Visibility

3DP Models promote preparedness of the patient and the treatment giver reducing their stress. Figure 7.

Customized Radiotherapy Planning

Customised patient-specific radiotherapy phantoms can be created of 3cms. thickness with clamps to place the sensors. Figure 8.

Precision

My first case of 3DP Models was for a 11-year-old with a tumour in anterior maxilla. After the printing only the tumour model was used for bone harvesting on the Iliac crest. The exact amount and precise contouring was possible, reducing surgical time. Figure 9.

Faster Surgery, Precise Surgery, Time Saving, Safer Surgery And Faster Recovery. Figure 10.

Conclusion

3 d Printing promises to be the next context in health care delivery protocols. Doctors need to explore the versatility of this innovation. The health care delivery benefits such as Precise treatment, Safer



Figure 4

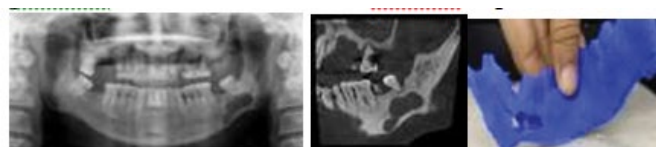


Figure 5



Figure 6



Figure 7

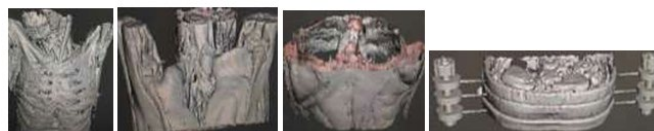


Figure 8



Figure 9



Figure 10

treatment, Better patient and attending Physicians-Surgeons understanding, health insurance and medico-legal positivity just cannot be ignored. The ability to show all tissues from skin, fascia, muscles, blood vessels, organs and bone and the disease specific changes greatly benefit both the experts and the juniors. The ability to create surgical guides enhances the skills of the doctors making treatment predictable and safe. It is giving quality assurance.

The advent of Artificial Intelligence and Augmented Reality along with 3 D Printing may just change the entire way we deliver Health Care.

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