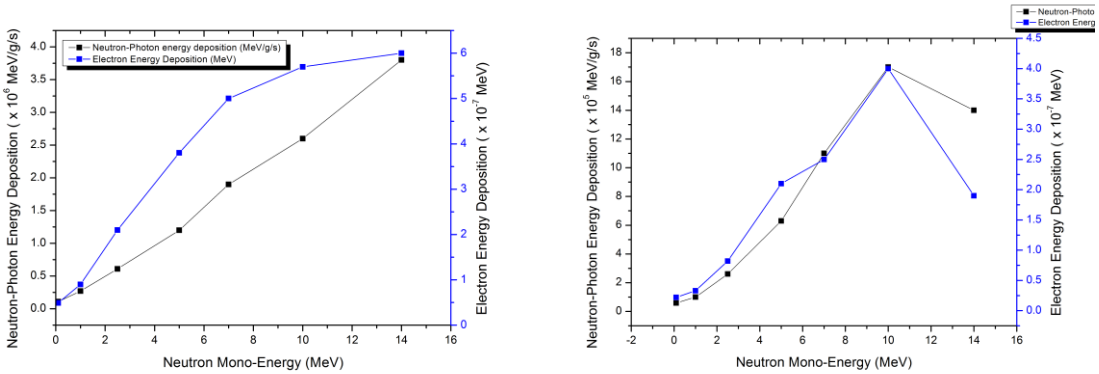

Fig.1. the detector response for 10 cm paraffin moderator in front of the source (left) and for 15 cm paraffin moderator in front of the source (right).

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THE PROBABILITY OF COMPLICATIONS OF ORGANS AT RISK (OAR) OF THE HEAD-AND-NECK WITH SIMULTANEOUS INTEGRATED BOOST AND SEQUENTIAL INTENSITY-MODULATED RADIOTHERAPY TECHNIQUES

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Head and neck cancer belong to the most prevalent cancers, and are the sixth leading cause of cancer worldwide. Radiotherapy is an important treatment modality in head and neck cancer. In recent years new radiotherapy techniques have been developed. The IMRT technique is characterized by a highly conformal dose distribution to targets, whereas a constraint dose to organs at risk (OARs) [1]. Sequential boost (SEQ) intensity-modulated radiation therapy regimens for HNC are composed of elective irradiation followed by a series of reduced boost fields aiming at the different overall doses needed for tumor control or OARs tolerance. Simultaneous integrated boost (SIB) technique gained popularity as it improved planning efficiency and escalated the dose per fraction delivered to the gross target volume (GTV) to potentially enhance tumor control [2]. SIB-IMRT is a safe and effective treatment for HNC, whereas it offers the following advantages: shortening of the treatment time and increased biologically equivalent dose (BED) to the tumor with dose per fraction slightly >2 Gy [3].

***Aim**:* The purpose of this work was to Compare prescription dose coverage of planning target volume (PTV) and complication of organs at risk (OAR) based on dose volume histogram (DVH) from sequential (SEQ) and simultaneous integrated boost (SIB) plans delivered with volumetric modulated arc therapy (VMAT) for patients with squamous cell cancer of the head and neck (HNSCC).

***Patients and methods**:* SEQ and SIB plans using VMAT for 10 HNSCC patients were generated and analyzed for differences in dose distribution, coverage to the planning target volumes (PTV) 70–50 and sparing of organs at risk (OAR). Also, biological effective doses were calculated for PTV70-50, brain stem and spinal cord.

Results: Both strategies achieved excellent PTV coverage and satisfactory OAR sparing. Measured D_{mean} were 71.9±0.7 and 61.11±2.95 for PTV70 and PTV50 respectively for SIB, and 72.6±0.3 and 62.9±3.2 for PTV70 and PTV50 respectively for SEQ (p = 0.002 for PTV70 and p = 0.006 for PTV50). The BED to PTV70 was higher in SIB- VMAT than SEQ-VMAT, 92.52±1 Gy10 and 87.58± 0.4 Gy10, respectively (p = 0.002 for PTV70). The mean dose of D_{max} to the spinal cord and brain stem in SIB VMAT were (39.6. ± 3.7 Gy and 31.3 ± 17.3 Gy) and in SEQ-VMAT (40.8± 5.6 Gy and 30.5 ± 17.6 Gy) respectively (p= 0.14 for spinal cord and p = 0.25 for brain stem).

The BED for spinal cord and brain stem were higher in SIB- VMAT than SEQ-VMAT, (70.33 ± 9.3 Gy and 55.7± 36.1 Gy) and (64.97± 11.5 Gy and 47.8 ± 32.2 Gy) respectively (p = 0.1 for spinal cord and p = 0.12 for brain stem).

Conclusion: The SIB technique is a more effective way of planning and delivering VMAT because it involves the use of the same plan for the entire course of treatment. it may have biologic advantages: the ability for dose/fraction escalation to a tumor and conformal avoidance of normal tissues. However, tissues embedded in the target volume may be at higher risk, and caution must be observed when applying higher than conventional fraction sizes. Furthermore, there may be an advantage in terms of higher biologically effective tumor dose and/or lower biologically effective dose normal tissues outside the tumor volume. SIB-VMAT may be superior to SEQ-VMAT in its convenience and short-course of treatment. However, there is an increased risk of complication due to the high dose per fraction and reduction in overall treatment time which leads to increase BED for SC and BS so the risk of complications are increased such as myelopathy. In contrast, sequential boost VMAT is more time consuming and requires the summation of 2 or more treatment plans, but less risk of complications in comparison to SIB such as myelopathy.

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НЕЙТРОН-ЗАХВАТНАЯ ТЕРАПИЯ НА ИССЛЕДОВАТЕЛЬСКОМ РЕАКТОРЕ ИРТ-Т

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Нейтрон-захватная терапия – один из методов радиационной терапии для селективного лечения злокачественных новообразований головного мозга, шеи, легких и т.д. В основе метода лежит ядерная реакция радиационного захвата нейтрона сильнопоглощающими изотопами (B^{10}, Gd^{157}) [1,2]. Традиционно, в качестве сильнопоглощающего элемента применяется B^{10} (бор нейтрон-захватная терапия) с сечением поглощения в тепловой области порядка 3800-4000 барн. Основной терапевтический эффект в данном случае