Osteosarcoma: concepts and prospects through the lens of translational science

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Late diagnosis and relapse after chemotherapy or surgical resection in case of osteosarcoma always remain a challenge. With low five-year survival rates, disease recurrence and poor prognosis, a better understanding of the molecular pathways involved in the progression of osteosarcoma is a prerequisite. A deeper understanding of osteosarcoma pathogenesis had led to an increase in translational studies for the development of more safer and targetted drugs. Recently, novel therapeutics have emerged which can be promising in increasing survival rates among osteosarcoma patients with minimal drug resistance. The treatment strategies include combination therapy, hormone therapy, immunotherapy, stem cell transplant, targetted therapy miRNA, CRISPR/Cas9, epitherapeutics, etc. Therapeutics like immunomodulators, cytokines, cancer vaccines, monoclonal antibodies, etc. are the major advancements in modern translational medicine especially in patients with resistance towards conventional treatment regimens. The validation and application of these novel therapies in the context of osteosarcoma prognosis, prophylaxis, diagnosis and treatment are subject to further researches and outcomes of clinical trials.

Keywords: CRISPR/Cas9, immunotherapy, Onco-miRs, osteosarcoma, translational science.

Osteosarcoma, a type of primary bone cancer is a rare tumour arising from the bone and occasionally from soft tissues. Cellular origin of osteosarcoma, 'sarcoma of bone' is primitive mesenchymal stem cells (MSCs). The commencement of primary bone cancer is mostly idiopathic. Osteosarcoma, chondrosarcoma and Ewing sarcoma are the most common subtypes of primary bone cancer[1]. The incidence rate of osteosarcoma varies with age, sex, race and other factors. Osteosarcoma is one of the most common bone cancers in adolescents, the third most frequently occurring cancer only after lymphoma and brain tumour. The rate of incidence for the disease is 3.4/million people/year worldwide[2]. The incidence rate of osteosarcoma has been reported to be 3–5 cases/year/million in males and 2–4 cases/year/million in females globally. It follows a bimodal age distribution with a major peak in the age group of 10–14 years and a second minor peak in adults over 65 years. The risk factors known to be associated with the development of the tumour are age, race, growth factors, genetic and epigenetic alterations caused by radiations and chemical agents[3]. Osteosarcoma commonly originates from within the medullary cavity of the metaphysis of long bones. It breaches the cortex to involve the adjoining soft tissues. Pathologically, the tumour is composed of spindle-shaped cells which produce an osteoid matrix, a distinguishing