Oncogenesis In Arthroplasty

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INTRODUCTION: Sporadic reports of sarcoma, lymphoma, and leukemia in patients who have undergone arthroplasty combined with the increasing use of metal-on-metal hip implants in young patients have raised concerns[1,2]. Whole blood and urinary levels of cobalt and chromium can be elevated in patients with these bearing surfaces. Published literature suggests that cancer risk in patients with hip or knee implants is similar to, or slightly lower than in the general population[3,4]. Animal models, however, have documented an increased risk of cancer with exposure to metals[5]. The recent recall of 100,000 hips by Johnson and Johnson further highlights the need for a joint replacement registry to study the long term effects of new technology. Our objective in this study was to perform a power analysis of metal and metal technology as it relates to oncogenesis and arthroplasty implants.

MATERIALS AND METHODS: The overall age-adjusted cancer incidence rate in the US is 471/100,000. The incidences of cancers which may be linked to Arthroplasty occur with much less frequency and include soft tissue [sarcoma] cancers (3/100,000), lymphoma (22/100,000), and leukemia (12/100,000). This fact combined with the low prevalence of Arthroplasty in the adult population irrespective of implant design (<1%) makes it extremely difficult for epidemiologists to accurately calculate the real cancer threat. We performed a series of power analyses to determine sample sizes needed to study the cancer risk associated with primary Arthroplasty.

RESULTS: Results indicate that detection of a 2-fold increased cancer risk associated with any implant using case-control study designs would require the study of over 1500 cancer cases along with 6000 matched controls.

CONCLUSIONS: Implementation of a national registry is urgently needed to prospectively determine if any new technology in arthroplasty may lead to an increased risk of cancer especially now that the age for arthroplasty continues to drop. Identification of even small problems with new technology requires thousands of cases. It's imperative that we implement strategies for post-release surveillance of implants, particularly with when new technology is introduced in the equation.

Table 1: 1% Population Metal On Metal

Odds Ratio	# Of Cancer Cases	# Of Controls
1.5	4,488	22,440
2.0	1,271	6,355
3.0	386	1,930
4.0	199	995
5.0	126	630

*power=0.80; alpha=0.05; ratio of 5 controls per case

Table 2: 0.1% Population Metal On Metal

Odds Ratio	# Of Cancer Cases	# Of Controls
1.5	44,157	220,785
2.0	12,463	62,315
3.0	3,742	18,190
4.0	1,909	9,545
5.0	1,200	6,000

*power=0.80; alpha=0.05; ratio of 5 controls per case

ACKNOWLEDGMENT: Funding for this investigation was provided by Mercy Hospital and the Arthritis Surgery Research Foundation.

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