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AAO Foundation Final Report Form
(a/o 5/30/2021)

Please prepare a report that addresses the following:

Type of Award: Biomedical Research Award, Center Award

Name(s) of Principal Investigator(s): Chung How Kau

Institution: University of Alabama at Birmingham

Title of Project: AStudy to Understand TMJ Function in Children with Juvenile Idiopathic Arthritis

Period of AAOF Support: 07-01-2021 to 06-30-2022

Amount of Funding: $30,000

Summary/Abstract:

There is little understanding of the Orthodontic management of Temporomandibular Joint (TMJ) arthritis in children in the United States and certainly less consensus on a global scale. Most Orthodontists in the United States receive referrals from Rheumatologists and Oral and Maxillofacial Surgeons informing them of the condition, but the exact prescribed Orthodontic treatment varies significantly across the country. The goal of this pilot study through the AAOF biomedical research award, is to provide baseline data for children who present with Juvenile Idiopathic Arthritis (JIA) and to understand the functional effects that a patient might present as compared to a normative group of patients within an Orthodontic Clinical setting. Clinical assessment of the TMJ is hampered by the low sensitivity of joint pain as well as the absence of physical exam findings early in the disease process due to the limited number of parameters used in the assessment of TMJ function used in previous studies. MRI is the “gold standard” but this technology is expensive and time consuming (which also needs to be performed under general anesthesia for young children). We hope to use this study to explore: (a)Whether we can use this protocol as a no-cost screening and monitoring tool for TMJ status in JIA patients, which can be included in the normal routine of JIA patient checkup. (b)In addition, we hope to understand

whether the comprehensive orofacial function examination can help determine TMJ status at an early stage, and also monitor the TMJ status change in the process of JIA treatment. (c)To evaluate if the protocol can help to increase early awareness of TMJ involvement and also determine if orthopedic intervention including functional orthodontic appliance, such as splint, is needed. (d)Difference in TMJ function can be detected between JIA patients with or without TMJ involvement, and finally (e)If the clinical orofacial function examination can be used as an effective tool to improve awareness of TMJ involvement in JIA patients especially amongst our medical colleagues.

Detailed results and inferences:

We screened over 300 subjects for this study. Our final numbers include 61 consented JIA subjects and 50 normal patients. This study has been published in 3 peer-reviewed articles and are attached. In addition, I have presented multiple seminars on the JIA data obtained from the AAOF award and acknowledged the foundation at these lectures.

We found some important findings:

1. **A Practice Based Research Network (PBRN) quick poll of 604 clinicians suggested that there was an interest in the management of JIA, but many clinicians did not feel that they had the necessary knowledge or experience to treat these patients. The study clearly highlights a distinct gap in awareness and understanding of JIA among clinicians polled. Future work in this area should focus on education and awareness across multiple specialties, clinical guidelines for the management of JIA, and a data repository of long-term outcomes.**
2. **Our research on the condylar-fossa relationship showed the depth of the mandibular fossa, the anterior joint spaces, the axial angles, and the resorption index showed statistically significant differences between the JIA and healthy groups in both left and right sides ($P < .05$). However, there was no statistically significant difference in the posterior joint spaces and mediolateral width between JIA and healthy groups in both sides ($P > .05$). The results of our study presented the destructive potential of juvenile idiopathic arthritis by using CBCT. CBCT scanning is a helpful tool in the evaluation of the radiographic result of TMJ.**
3. **Our research of 3D airway showed statistically significant differences were seen in the nasopharynx airway volume ($p = 0.004$), total upper airway volume ($p = 0.013$), and the most constricted cross-sectional area ($p = 0.026$). The oropharynx airway volume was not statistically significant ($p = 0.051$). For cephalometric values, only the posterior facial height showed a statistically significant difference ($p = 0.024$). We concluded that there was a significant difference in airway dimensions in the JIA patients as compared to the control patients. In addition, the posterior facial dimensions seem to be affected in JIA patients. The ODDs ratio analysis further corroborated the findings that were significant.**

Respond to the following questions:

1. Were the original, specific aims of the proposal realized? **Yes**

2. Were the results published? Yes
    a. If so, cite reference/s for publication/s including titles, dates, author or co-authors, journal, issue and page numbers

    i) Gibson M, Cron RQ, Stoll ML, Kinard BE, Patterson T, Kau CH. A 3D CBCT Analysis of Airway and Cephalometric Values in Patients Diagnosed with Juvenile Idiopathic Arthritis Compared to a Control Group. *Applied Sciences*. 2022; 12(9):4286. https://doi.org/10.3390/app12094286

    ii) Celebi AA, Cron R, Stoll M, Simsek S, Kinard B, Waite PD, Wang J, Vo V, Tran L, Kau CH. Comparison of the condyle-fossa relationship and resorption between patients with and without Juvenile Idiopathic Arthritis (JIA). J Oral Maxillofac Surg. 2021 Sep 12:S0278-2391(21)01114-9. doi: 10.1016/j.joms.2021.09.004. Epub ahead of print. PMID: 34627744.

    iii) Kau CH, Allareddy V, Stoustrup P, Pedersen T, Kinard B, Cron RQ, Stoll ML, Gilbert GH. Management of juvenile idiopathic arthritis: Preliminary qualitative findings from the National Dental Practice-Based Research Network. J World Fed Orthod. 2021 Jun;10(2):70-73. doi: 10.1016/j.ejwf.2021.01.003. Epub 2021 Mar 5

    b. Was AAOF support acknowledged? **Yes**

3. Have the results of this proposal been presented? **Yes**
    a. If so, list titles, author or co-authors of these presentation/s, year and locations

    i) Invited Lecturer: Orthodontic Management of the TMJ of patients with Juvenile Idiopathic Arthritis, 2023 American Association of Orthodontists Conference, Chicago, UNITED STATES, 21-24 April 2023

    ii) Keynote Speaker: Understanding the TMJ and Orthodontics. Association of Orthodontists Singapore Conference, Singapore, 17-19 February 2023

    b. Was AAOF support acknowledged? **Yes**

4. To what extent have you used, or how do you intend to use, AAOF funding to further your career?

I plan to submit a continuation of the study to the AAOF as a biomedical research award. I will be requesting support to follow up my patients and to under the disease progression. I am planning to use these datasets to write an R03 or R01 in the future.

Accounting for Project:

There is $5000 left over in the budget. I am requesting that the AAOF allow me to continue to use the funds for further analysis on the dataset and to continue to recall patients for the study.