Data Article

Optic disc Edema in patients with fibrous dysplasia/McCune-Albright syndrome: Craniomorphometric analysis and peripapillary retinal nerve fiber layer data

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Abstract
This article reports quantitative measurements of intracranial volume, optic canal area, and peripapillary retinal nerve fiber layer (RNFL) for a cohort of 124 patients with craniofacial fibrous dysplasia/McCune-Albright Syndrome (FD/MAS), previously used to determine risks for developing optic disc edema [1]. Of these, 7 subjects were diagnosed with optic disc edema. OSIRIX imaging analysis software was used to collect intracranial volume and optic canal diameter for 107 patients, via 3D multiplanar reconstruction (MPR) of ≤5 mm axial CT slices. Spectral-domain Optical Coherence Tomography (OCT) was performed with the Cirrus-HD OCT (Carl Zeiss Meditec, Inc., Dublin, CA). The Optic Disc Cube 200 × 200 protocol was used for acquisition and analysis of the RNFL for 69 patients. The data can be used to assess typical ranges for intracranial volume, optic canal area, and RNFL in the craniofacial FD/MAS population and to assess ranges concerning for optic disc edema.

[1] Raborn LN, Pan KS, FitzGibbon EJ, Collins MT, Boyce AM. Optic disc edema in fibrous dysplasia/McCune-Albright syndrome: Prevalence, etiologies, and clinical implications. Bone.
Specifications Table

| Subject                       | Endocrinology, Diabetes and Metabolism |
|-------------------------------|----------------------------------------|
| Specific subject area         | Fibrous dysplasia/McCune-Albright Syndrome (FD/MAS) affected cohort |
| craniomorphometric and peripapillary nerve fiber layer (RNFL) measurements | |
| Type of data                  | Table, Figure                          |
| How data were acquired        | OSIRIX imaging analysis software and Spectral-domain Optical Coherence Tomography (OCT) using Cirrus-HD OCT (Carl Zeiss Meditec, Inc., Dublin, CA) |
| Data format                   | Raw                                    |
| Parameters for data collection| OSIRIX imaging analysis was used with region of interest function to calculate intracranial volume and optic canal area acquired through 3D multiplanar reconstruction of ≤5 mm axial CT slices, Optic Disc Cube 200 × 200 protocol was used for acquisition and analysis of the RNFL. |
| Description of data collection| OSIRIX software was used to determine intracranial volume and optic canal area. Region of interest (ROI) was outlined on CT images with ≤5 mm axial slices. Volume was calculated by adding all ROIs outlining intracranial area. 3D multiplanar reconstruction (MPR) was used to align axial, coronal, and sagittal views of the optic canal and ROI outlining the canal yielded area. Spectral-domain Optical Coherence Tomography (OCT) was performed with the Cirrus-HD OCT. The Optic Disc Cube 200 × 200 protocol was used for acquisition and analysis of the peripapillary retinal nerve fiber layer (RNFL). |
| Data source location          | National Institutes of Health          |
|                               | Bethesda, MD                           |
| Data accessibility            | With the article                       |
| Related research article      | Raborn LN, Pan KS, FitzGibbon EJ, Collins MT, Boyce AM. Optic disc edema in fibrous dysplasia/McCune-Albright syndrome: Prevalence, etiologies, and clinical implications. Bone. 2021 Feb;143:115661. 10.1016/j.bone.2020.115661. Epub 2020 Sep 24. PMID: 32979536. |

Value of the Data

- We demonstrate a reliable method of determining optic canal area and intracranial volume using OSIRIX imaging analysis software and the data we collected by this method for a cohort of patients with FD/MAS and craniofacial involvement. We present RNFL measurements for a range of patients, including 7 diagnosed with optic disc edema and 62 with no optic disc edema for future comparison.
- This data is useful for investigators and clinicians caring for patients with FD/MAS.
- This data can be used to further study the effect of FD/MAS disease severity on intracranial volume and optic canal area or to investigate the utilization of RNFL in predicting optic disc edema.
- FD/MAS is a rare disease, and we provide data from the largest cohort study of optic disc edema to date which can be used for future research.
- The usefulness of OCT in the population is limited by a lack of standard ranges for pediatric patients, which could hinder its usefulness in identifying optic disc edema. We present a large cohort of patients with RNFL data that can be utilized to identify RNFL dimensions concerning for optic disc edema.
1. Data Description

Craniomorphometric analysis and peripapillary retinal nerve fiber layer data in patients with craniofacial fibrous dysplasia.

2. Experimental Design, Materials and Methods

A full description of study design, methods, participant characterization, and optic disc edema diagnosis can be found in our corresponding published literature [1]. Subjects were evaluated between 2000 and 2019 at the National Institutes of Health as part of an ongoing natural history study of FD/MAS (NCT00001727). The study was approved by the Institutional Review Board of the National Institute of Dental and Craniofacial Research, and informed consent/assent was obtained from all subjects and/or guardians. All subjects were diagnosed with craniofacial FD/MAS according to previously published guidelines [2] and diagnosed with optic disc edema by neuro-ophthalmologic examination [1]. Subject ODE-2 had optic disc edema in the left eye only and optic neuropathy diagnosed in the right eye. Subject ODE-7 was diagnosed with optic disc edema prior to evaluation and was started on Acetazolamide therapy. At the time of evaluation, her optic disc edema was resolved.

Craniomorphometric analyses was performed using OSIRIX imaging analysis software and a single trained reader (KSP) to determine intracranial volume and optic canal area. All analysis utilized CT head imaging with axial slices ≤5mm. To determine intracranial volume, a region of interest (ROI) was traced manually to include intracranial area only (Fig. 1). All lateral CT slices were manually traced because of variation in intracranial calvarial contour (Fig. 1A, B). Midline slices typically showed less intracranial calvarial contour variation and were manually traced every 3-5 slices (Fig. 1C, D). Using the software, remaining ROIs were automatically generated. The reader examined automated ROI tracings and manually corrected errors. Each ROI contained intracranial area that was used to determine total intracranial volume (Fig. 1E). Using OSIRIX, intracranial volume was calculated from the outlined ROIs \( \text{ICV} = \Sigma (A1, A2, \ldots , Az) \times \text{CT} \).

**Fig. 1.** Craniomorphometric analysis of intracranial volume in a subject with fibrous dysplasia/McCune-Albright syndrome, utilizing OSIRIX software. Using CT head imaging with ≤5 mm axial slices, a region of interest (ROI) was traced to include intracranial area. Tracing was started with lateral slices (A, B) and advanced towards medial slices (C-E). The software calculated the area encompassed within ROIs and used this to determine total volume (E).
Fig. 2. Intracranial volume was determined through a summation of region of interests (ROIs). A 3D rendering of the volume was generated using OSIRIX software. A) Top down B) Bottom up and C) Sagittal views of 3D rendering are shown.

Fig. 3. 3D Multiplanar Reconstruction with OSIRIX software allowed for simultaneous visualization of sagittal plane (A) in yellow, coronal plane (B) in blue, and axial plane (C) in purple.

slice thickness). A 3D volume was rendered (Fig. 2) along with volume output and is described in Table 1. Optic canal area was also determined using OSIRIX software and CT head imaging with ≤5 mm axial slices. 3D Multiplanar Reconstruction (MPR) was utilized, which allowed for simultaneous visualization of the optic canal in axial, sagittal, and coronal planes (Fig. 3). The optic canal was then aligned in each plane (Fig. 4). Using coronal plane rendering of optic canal, the ROI function was used to manually trace the optic canal using digital calipers and determine the area (Fig. 5). Optic canal area for each eye is listed in Table 1.

Spectral-domain Optical Coherence Tomography (OCT) was performed with the Cirrus-HD OCT (Carl Zeiss Meditec, Inc., Dublin, CA). The Optic Disc Cube 200 × 200 protocol was used for acquisition and analysis of the total RNFL and recorded in Table 2.
Table 1  
Craniomorphometric measurements of intracranial volume and optic canal area for craniofacial fibrous dysplasia/McCune-Albright Syndrome cohort.

| Subject | Sex | Age (years) | Race/Ethnicity                  | Intracranial Volume (cm³) | OD OCA (mm²) | OS OCA (mm²) |
|---------|-----|-------------|---------------------------------|---------------------------|--------------|--------------|
| Control 1 | F   | 19          | White                           | 1275                      | 14.02        | 13.4         |
| Control 2 | F   | 34          | White                           | 1289                      | 10.03        | 11.5         |
| Control 3 | F   | 33          | White                           | 1129                      | 11.89        | 9.1          |
| Control 4 | M   | 19          | Black or African American       | 1298                      | 12.53        | 12.72        |
| Control 5 | F   | 60          | White                           | 1360                      | 13.56        | 10.78        |
| Control 6 | M   | 41          | White                           | 1622                      | 19.21        | 19.2         |
| Control 7 | F   | 22          | White                           | 1456                      | 11.32        | 11.94        |
| Control 8 | F   | 28          | White                           | 1318                      | 16.12        | 13.67        |
| Control 9 | F   | 21          | White                           | 1170                      | 12.76        | 12.72        |
| Control 10 | F  | 34          | White                           | 1309                      | 12.01        | 12.72        |
| Control 12 | M  | 33          | White                           | 1432                      | 15.75        | 14.66        |
| Control 13 | F  | 28          | White                           | 1135                      | 10.34        | 9.32         |
| Control 14 | M  | 30          | White                           | 1523                      | 11.01        | 11.06        |
| Control 15 | F  | 27          | Hispanic or Latino              | 1155                      | 12.08        | 12.22        |
| Control 18 | M  | 50          | White                           | 1432                      | 16.96        | 16.67        |
| Control 19 | F  | 18          | White                           | 1339                      | 10.91        | 10.18        |
| Control 20 | F  | 56          | White                           | 1491                      | 17.86        | 17.38        |
| Control 21 | M  | 17          | White                           | 1624                      | 18.28        | 20.25        |
| Control 22 | M  | 57          | White                           | 1390                      | 12.51        | 12.72        |
| Control 23 | F  | 46          | Hispanic or Latino              | 1201                      | 19.41        | 16.52        |
| Control 24 | F  | 57          | White                           | 1299                      | 14.16        | 12.51        |
| Control 25 | F  | 23          | Asian                           | 1306                      | 10.07        | 11.16        |
| Control 26 | F  | 23          | White                           | 1269                      | 12.42        | 12.88        |
| Control 27 | M  | 22          | White                           | 1503                      | 19.63        | 13.32        |
| Control 29 | M  | 35          | Asian                           | 1337                      | 15.28        | 13.66        |
| Control 30 | F  | 18          | Hispanic or Latino              | 1189                      | 15.16        | 11.58        |
| Control 31 | F  | 47          | White                           | 1266                      | 12.45        | 12.04        |
| Control 32 | F  | 9           | White                           | 1333                      | 11.47        | 10.93        |
| Control 33 | M  | 15          | White                           | 1790                      | 11.81        | 13.56        |
| Control 34 | F  | 19          | White                           | 1436                      | 11.51        | 12.84        |
| Control 35 | M  | 46          | White                           | 1422                      | 14.21        | 12.59        |
| Control 36 | F  | 13          | White                           | 1419                      | 15.95        | 16.61        |
| Control 37 | F  | 52          | White                           | 1359                      | 21.42        | 18.97        |
| Control 38 | M  | 48          | Asian                           | 1419                      | 12.71        | 12.09        |
| Control 39 | F  | 37          | White                           | 1245                      | 11.6         | 11.06        |
| Control 40 | M  | 11          | White                           | 1272                      | 12.37        | 10.6         |
| Control 41 | F  | 21          | Asian                           | 1338                      | 10.62        | 10.84        |
| Control 42 | F  | 6           | White                           | 1306                      | 12.66        | 11.77        |
| Control 43 | M  | 13          | White                           | 1425                      | 10.31        | 10.17        |
| Control 44 | M  | 16          | White                           | 1258                      | 13.59        | 12.95        |
| Control 45 | M  | 19          | White                           | 1414                      | 14.82        | 14.45        |
| Control 46 | F  | 11          | White                           | 1120                      | 8.8          | 7.57         |
| Control 48 | M  | 13          | White                           | 1395                      | 12.64        | 13.24        |
| Control 49 | F  | 6           | White                           | 1029                      | 9.77         | 8.95         |
| Control 50 | M  | 8           | Asian                           | 1414                      | 18.73        | 17.42        |
| Control 51 | M  | 59          | Hispanic or Latino              | 1559                      | 19.02        | 18.74        |
| Control 52 | F  | 9           | White                           | 1208                      | 10.69        | 11.38        |
| Control 53 | F  | 22          | White                           | 1255                      | 14.52        | 15.31        |
| Control 54 | M  | 10          | Black or African American       | 1408                      | 12.09        | 11.06        |
| Control 55 | F  | 24          | White                           | 1542                      | 12.85        | 12.65        |
| Control 56 | F  | 57          | White                           | 1205                      | 14.32        | 13.79        |
| Control 57 | M  | 50          | White                           | 1421                      | 15.12        | 14.36        |
| Control 59 | M  | 10          | White                           | 1590                      | 12.1         | 10.98        |
| Control 61 | F  | 15          | Black or African American       | 1034                      | 11.58        | 10.66        |
| Control 62 | F  | 5           | White                           | 1023                      | 11.96        | 11.65        |
| Control 63 | M  | 20          | Hispanic or Latino              | 1605                      | 15.8         | 14.57        |
| Control 64 | F  | 5           | White                           | 1395                      | 13.34        | 13.58        |
| Control 65 | M  | 20          | White                           | 1583                      | 17.63        | 17.74        |

(continued on next page)
Table 1 (continued)

| Subject | Sex | Age (years) | Race/Ethnicity       | Intracranial Volume (cm$^3$) | OD OCA (mm$^2$) | OS OCA (mm$^2$) |
|---------|-----|-------------|----------------------|------------------------------|----------------|----------------|
| Control 66 | M  | 24          | White                | 1482                         | 12.37          | 12.9          |
| Control 69 | M  | 18          | White                | 1475                         | 16.57          | 15.7          |
| Control 70 | F  | 5           | Asian                | 1399                         | 14.94          | 10.82         |
| Control 71 | F  | 80          | White                | 1432                         | 11.01          | 10.03         |
| Control 72 | M  | 6           | White                | 1394                         | 13.39          | 13.37         |
| Control 74 | M  | 10          | White                | 1410                         | 13.39          | 14.24         |
| Control 77 | F  | 9           | White                | 1395                         | 15.87          | 15.79         |
| Control 78 | F  | 10          | White                | 1319                         | 10.4           | 11.79         |
| Control 79 | F  | 37          | White                | 1273                         | 12.85          | 13.18         |
| Control 80 | F  | 8           | White                | 1328                         | 19.18          | 19.52         |
| Control 81 | M  | 8           | Hispanic or Latino   | 1404                         | 18.19          | 17.77         |
| Control 83 | F  | 35          | Asian                | 1414                         | 13.08          | 13.25         |
| Control 84 | F  | 7           | White                | 1180                         | 12.73          | 13.76         |
| Control 85 | M  | 30          | White                | 1358                         | 11.81          | 11.46         |
| Control 86 | F  | 9           | White                | 1315                         | 10.88          | 10.95         |
| Control 87 | F  | 16          | Multiple Race        | 1349                         | 7.54           | 11.65         |
| Control 88 | F  | 6           | White                | 1351                         | 18.55          | 17.99         |
| Control 89 | M  | 16          | Hispanic or Latino   | 1359                         | 17.86          | 19.51         |
| Control 91 | M  | 9           | White                | 1287                         | 12.27          | 11.71         |
| Control 92 | M  | 12          | White                | 1526                         | 15.46          | 17.45         |
| Control 93 | M  | 4           | White                | 1303                         | 13.38          | 11.11         |
| Control 94 | F  | 19          | White                | 1452                         | 15.25          | 13.14         |
| Control 95 | M  | 10          | White                | 1452                         | 13.43          | 13.64         |
| Control 97 | M  | 25          | Multiple Race        | 1747                         | 12.37          | 11.25         |
| Control 98 | M  | 52          | White                | 1452                         | 10.49          | 10.72         |
| Control 99 | M  | 6           | Hispanic or Latino   | 1462                         | 14.25          | 12.79         |
| Control 100 | F  | 3           | Asian                | 1418                         | 15.78          | 15.24         |
| Control 101 | F  | 19          | White                | 1330                         | 12.71          | 13.55         |
| Control 102 | M  | 4           | Hispanic or Latino   | 1240                         | 18.15          | 14.46         |
| Control 103 | F  | 55          | White                | 1239                         | 18.31          | 15.78         |
| Control 104 | F  | 26          | White                | 1578                         | 17.25          | 15.82         |
| Control 105 | M  | 11          | White                | 1388                         | 10.46          | 8.47          |
| Control 106 | F  | 5           | Multiple Race        | 1210                         | 14.97          | 14.02         |
| Control 109 | F  | 6           | Asian                | 1304                         | 15.09          | 15.59         |
| Control 110 | M  | 19          | White                | 1294                         | 11.59          | 11.8          |
| Control 111 | F  | 32          | White                | 1616                         | 17.7           | 17.04         |
| Control 112 | F  | 27          | White                | 1223                         | 8.51           | 9.61          |
| Control 113 | F  | 3           | White                | 997                          | 10.11          | 11.59         |
| Control 114 | F  | 43          | White                | 1297                         | 9.8            | 9.46          |
| Control 115 | F  | 6           | White                | 1167                         | 13.06          | 12.74         |
| Control 116 | F  | 69          | White                | 1397                         | 12.94          | 10.42         |
| Control 117 | M  | 12          | Black or African American | 1019                        | 11.9           | 12.35         |
| ODE 1     | M  | 14          | White                | 1354                         | 11.39          | 14.96         |
| ODE 2     | M  | 15          | White                | 1316                         | 8.85*          | 8.61          |
| ODE 3     | M  | 12          | White                | 1611                         | 16.93          | 12.39         |
| ODE 4     | M  | 17          | White                | 1655                         | 17.75          | 15.04         |
| ODE 5     | F  | 17          | Asian                | 1224                         | 15.48          | 12.19         |
| ODE 6     | M  | 7           | White                | 1290                         | 14.46          | 17.28         |
| ODE 7**   | F  | 5           | Asian                | 1004                         | 12.04          | 11.26         |

Both intracranial volume and optic canal area were collected by importing Computed Tomography (CT) images into OSIRIX software, which were then used to create a 3D reconstruction of the image. Intracranial area and the area of the optic canal were measured by outlining the area of interest within image cross-sections. Intracranial volume was calculated via OSIRIX software which sums the intracranial area outlined in all cross-sections and multiplies by cross-section thickness. Race and ethnicity were self-reported by each subject. ODE = subject with diagnosis optic disc edema, Control = subject with no diagnosis of optic disc edema, M = male, F = female, OD = right eye, OCA = optic canal area, OS = left eye, (*) = subject had diagnosis optic neuropathy in right eye, (**) = subject was diagnosed with ODE prior to visit and showed resolution during time of exam on Acetazolamide therapy.
### Table 2
Peripapillary nerve fiber layer (RNFL) measurements of craniofacial fibrous dysplasia/McCune-Albright Syndrome cohort.

| Subject | Sex | Race/Ethnicity              | Age (years) | RNFL OD (μm) | RNFL OS (μm) |
|---------|-----|-----------------------------|-------------|--------------|--------------|
| Control 3 | F   | White                        | 33          | 83           | 78           |
| Control 7 | F   | White                        | 22          | 93           | 100          |
| Control 8 | F   | White                        | 28          | 100          | 97           |
| Control 11 | F   | White                        | 32          | 86           | 79           |
| Control 12 | M   | White                        | 33          | 111          | 107          |
| Control 14 | M   | White                        | 30          | 75           | 81           |
| Control 15 | F   | Hispanic or Latino           | 27          | 105          | 107          |
| Control 16 | F   | White                        | 32          | 108          | 109          |
| Control 17 | F   | Asian                        | 28          | 109          | 101          |
| Control 21 | M   | White                        | 17          | 102          | 96           |
| Control 22 | M   | White                        | 57          | 80           | 77           |
| Control 24 | F   | White                        | 57          | 106          | 107          |
| Control 27 | M   | White                        | 22          | 93           | 91           |
| Control 28 | M   | White                        | 56          | 79           | 82           |
| Control 31 | F   | White                        | 47          | 94           | 94           |
| Control 34 | F   | White                        | 19          | 101          | 101          |
| Control 44 | M   | White                        | 16          | 96           | 95           |
| Control 45 | M   | White                        | 19          | 90           | 92           |
| Control 47 | M   | White                        | 18          | 94           | 94           |
| Control 58 | F   | White                        | 18          | 105          | 103          |
| Control 60 | F   | White                        | 24          | 100          | 98           |
| Control 63 | M   | Hispanic or Latino           | 20          | 114          | 110          |
| Control 65 | M   | White                        | 20          | 110          | 109          |
| Control 66 | M   | White                        | 24          | 94           | 99           |
| Control 67 | F   | Asian                        | 11          | 98           | 106          |
| Control 68 | F   | Asian                        | 31          | 90           | 94           |
| Control 69 | M   | White                        | 18          | 89           | 112          |
| Control 72 | F   | White                        | 6           | 98           | 97           |
| Control 73 | F   | Asian                        | 11          | 92           | 94           |
| Control 74 | M   | White                        | 10          | 95           | 97           |
| Control 75 | F   | White                        | 20          | 103          | 99           |
| Control 76 | F   | White                        | 8           | 103          | 103          |
| Control 77 | F   | White                        | 9           | 90           | 91           |
| Control 78 | F   | White                        | 10          | 102          | 106          |
| Control 80 | F   | White                        | 8           | 110          | 99           |
| Control 82 | F   | White                        | 49          | 94           | 92           |
| Control 83 | F   | Asian                        | 35          | 111          | 112          |
| Control 84 | F   | White                        | 7           | 106          | 112          |
| Control 85 | M   | White                        | 30          | 106          | 101          |
| Control 86 | F   | White                        | 9           | 116          | 110          |
| Control 87 | F   | Multiple Race                | 16          | 106          | 110          |
| Control 89 | M   | Hispanic or Latino           | 16          | 83           | 85           |
| Control 90 | F   | White                        | 8           | 84           | 96           |
| Control 91 | M   | White                        | 9           | 95           | 107          |
| Control 93 | M   | White                        | 4           | 115          | 115          |
| Control 94 | F   | White                        | 19          | 101          | 101          |
| Control 95 | M   | White                        | 10          | 91           | 116          |
| Control 96 | F   | Hispanic or Latino           | 6           | 91           | 89           |
| Control 98 | M   | White                        | 52          | 87           | 90           |
| Control 99 | M   | Hispanic or Latino           | 6           | 105          | 103          |
| Control 101 | F    | White                        | 19          | 96           | 101          |
| Control 102 | M    | Hispanic or Latino           | 4           | 76           | 77           |
| Control 103 | F    | White                        | 55          | 85           | 88           |
| Control 105 | M    | White                        | 11          | 96           | 90           |
| Control 107 | M    | Black or African American    | 5           | 107          | 89           |
| Control 108 | M    | White                        | 66          | 88           | 90           |
| Control 109 | F    | Asian                        | 6           | 100          | 93           |
| Control 110 | M    | White                        | 19          | 84           | 92           |
| Control 111 | F    | White                        | 32          | 104          | 105          |

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Table 2 (continued)

| Subject | Sex | Race/Ethnicity                  | Age (years) | RNFL OD (μm) | RNFL OS (μm) |
|---------|-----|---------------------------------|-------------|--------------|--------------|
| Control 112 | F   | White                           | 27          | 105          | 111          |
| Control 115 | F   | White                           | 6           | 107          | 100          |
| Control 117 | M   | Black or African American       | 12          | 129          | 119          |
| ODE 1    | M   | White                           | 13          | 124          | 96           |
| ODE 2    | M   | White                           | 15          | 67*          | 139          |
| ODE 3    | M   | White                           | 11          | 118          | 158          |
| ODE 4    | M   | White                           | 17          | 154          | 198          |
| ODE 5    | F   | Asian                           | 16          | 125          | 113          |
| ODE 6    | M   | White                           | 7           | 139          | 132          |
| ODE 7**  | F   | Asian                           | 5           | 110          | 101          |

RNFL measurements were acquired via Spectral-domain Optical Coherence Tomography (OCT), using a Cirrus-HD OCT, and the Optic Disc Cube 200 × 200 protocol. Race and ethnicity were self-reported by each subject. ODE = subject with diagnosed optic disc edema on exam, Control = subject with no diagnosis of optic disc edema, M = male, F = female, RNFL = peripapillary nerve fiber layer, OD = right eye, OS = left eye, (*) = subject had diagnosed optic neuropathy in right eye, (**) = subject was diagnosed with ODE prior to visit and showed resolution during time of exam on Acetazolamide therapy.

Fig. 4. Optic canal was aligned using 3D Multiplanar Reconstruction in a subject with fibrous dysplasia/McCune-Albright syndrome with OSIRIX imaging software in sagittal plane (A) in yellow, coronal plane (B) in blue, and axial plane (C) in purple.
Fig. 5. Using coronal plane rendering of optic canal aligned with 3D Multiplanar Reconstruction, the region of interest (ROI) was traced around the optic canal (A) and used to determine area through OSIRIX software (B).

Ethics Statement

Subjects were enrolled in the National Institutes of Health ongoing natural history study of FD/MAS (NCT0001727). The study was approved by the Institutional Review Board of the National Institute of Dental and Craniofacial Research, and informed consent/assent was obtained from all subjects and/or guardians.

Declaration of Competing Interest

NIDCR receives funding from Amgen, Inc and Ultragenyx, Inc for studies in fibrous dysplasia.

CRediT Author Statement

Layne N. Raborn: Conceptualization, Methodology, Investigation, Visualization, Writing – original draft, Data curation; Kristen S. Pan: Conceptualization, Methodology, Software, Validation, Formal analysis, Data curation, Investigation; Edmond J. FitzGibbon: Resources, Writing – review & editing, Supervision, Project administration, Funding acquisition; Michael T. Collins: Conceptualization, Resources, Writing – review & editing, Supervision, Project administration, Funding acquisition; Alison M. Boyce: Conceptualization, Resources, Writing – review & editing, Supervision, Project administration, Funding acquisition, Supervision, Visualization.

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