

**Research Article**

**Study of duplication of optic canal in hundred dry human skull bones**

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**Abstract**

**Introduction:** The pyradimal shaped bony orbit communicates with middle cranial fossa by means of optic canal which transmits optic nerve and ophthalmic artery. Unilateral, bilateral duplication of optic canal is a rare entity.

**Methods:** One hundred adult human skull bones collected from north Karnataka region were studied for duplication of optic canal. Complete duplication, partial duplication, whether unilateral or bilateral duplication were studied.

**Results:** Out of one hundred skull bones, in one case (1%), unilateral duplication of optic canal was noted which was complete and was on left side.

**Conclusion:** The knowledge of duplication of optic canal increases the success rate of surgical procedures of optic canal and minimizes the risk of injury to optic nerve and ophthalmic artery.

**Keywords:** orbit, optic canal, duplication, skull, sphenoid

**1. Introduction**

The pyramidal shaped bony orbit superomedially leads to a bony optic canal which establishes communication with middle cranial fossa. Optic canal is bounded laterally by the lesser wing of sphenoid, in front and behind by the two roots of lesser wing and medially by the body of sphenoid bone. It transmits optic nerve and ophthalmic artery<sup>1</sup>. Optic canal may show duplications. Unilateral or bilateral duplications were reported by many workers earlier in the present study dry human skull bone were studied in detail regarding duplications of optic canals<sup>2</sup>.

**2. Methods**

One hundred adult human skull bones collected from north Karnataka region were studied for duplication of optic canal. Complete duplication, partial duplication of optic canals were studied using digital photography and manual confirmation. Well ossified skull bones were taken for study.



### 3. Results

Out of one hundred skull bones, (200 bony orbits with optic canals), in one case (1%), a complete unilateral duplication of optic canal is noted on left side [left optic canal]. The other optic canal was normal without duplication. The duplicating bony ridge is complete without breach and dividing the left optic canal in to two. The main optic canal is normal in position and the accessory canal is inferolaterally placed. The bony ridge duplicating the canal is 1mm in thickness and 5mm in length.

**Fig. 2. Figure showing duplication of optic canal**



### 4. Discussion

During the routine osteology teachings, duplication of optic canals though a rare entity may be found, among these bilateral duplications are still very rare.

Double (1903) postulated that the duplication of optic canal is due to the ossification of meninges covering the optic nerve. This postulation may not hold good as most cases reported were children<sup>2</sup>.

White (1924) reported 3 cases in newborns<sup>3</sup>, and Whitnall (1932) noted a photographic record of this case<sup>4</sup>. Bilateral duplications were very rare.

Augier (1931) opined that duplication of optic canal represents the persistence of a foramen lee trou metoptique. He opined that accessory foramen may be due to presence of an aberrant ophthalmic vein as a shallow groove leads to the site of cavernous sinus suggesting it might have transmitted inferior ophthalmic vein<sup>5</sup>.

Wolf speculated that a band of connective or fibrous tissue which separates optic nerve and ophthalmic artery might have ossified leading to duplication of optic canal<sup>6</sup>.

Keyes (1935) proposed that a large bony projection in the inferolateral wall of optic canal duplicates the optic canal<sup>7</sup>.

The duplication optic canal is developmental in origin. This duplication is dependant upon development of lower root of lesser wing of sphenoid bone. The anomalous development of it may lead to duplication and not due to ossification. The larges canal transmits optic nerve with meninges and the smaller canal transmits ophthalmic artery. The proximal portion of ophthalmic artery can be explained by the developmental pattern of lower root of lesser wing of sphenoid bone<sup>8</sup>.

Berlis *et al* studied by using computerized axial tomography scans and reported 2.5% incidence of duplication of optic canal<sup>9</sup>.

Mandavi singh studied 435 Japanese skull orbits for duplication of optic canal and noted 13 skulls with duplication of optic canals. Among these 7 skull bones showed bilateral duplication. It was further noted that duplication was more on left side and belonged to male skull bones of age 30 years<sup>10</sup>.

Orhan studied 369 skulls out of these, duplication was noted in 2 skulls. In one case, the duplication was unilateral and bilateral duplication was noted in the other skull bone<sup>11</sup>.

Bilateral duplication of optic canals are still very rare as compared to unilateral duplications. Among few workers, warwick<sup>12</sup> and choudhary<sup>13</sup> reported bilateral duplication of optic canal.

The knowledge of duplication of optic canal is very useful in surgical procedures of optic canal and pre procedure angiography is essential<sup>14</sup>.

## 5. Conclusion

The knowledge of duplication of optic canal increases the success rate of surgical procedure of optic canal like decompression, tumour excision, approaching sella turcica, cavernous sinus approach, pneumatization procedures. While doing endoscopic optic nerve decompression in sphenoidal injuries and malignancies, one should be aware of accessory optic canal.

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