Significance of Ultrasonography in Evaluation of Vitreo-retinal Pathologies

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Purpose: To assess the diagnostic value of ultrasonography in the detection of vitreo-retinal pathologies. Material and Methods: This prospective study included all patients from retina department in Eye Clinic University Clinical Center Tuzla first time referred and examined by a single experienced vitreo-retinal surgeon in period from January 2011. to January 2012. Complete ophthalmic examination and ultrasonography—standardized echography were performed to all patients for detection and confirmation of vitreo-retinal pathology. Results: Study included 146 eyes from 122 patients. 58 (39,7%) eyes had poor posterior segment visualization, 21 (14,4%) eyes due to dense cataracts and 37 (25,3%) eyes due to different vitreous opacities. 88 (60,3%) eyes had good or partial posterior eye segment visualization, where 67 (45,9%) eyes had proliferative vitreo-retinopathy and 55 (37,7%) eyes had tractional retinal detachment. Most common causes for referral to vitreo-retinal surgeon were ocular complications of diabetes mellitus 94 (64,4%), ocular trauma 18 (12,3%), rhegmatogenous retinal detachment 16 (10,9%) and intraocular inflammation 9 (6,2%). Ultrasonography confirmed suspected diagnosis and operative management plan in 120 (82,2%) eyes, subclassified previously established diagnosis in 19 (13%) eyes and helped further operative planning and established completely new diagnosis and changed initial management plan in 7 (4,8%) eyes. The final clinical diagnosis confirmed the ultrasonography findings in 142 from 146 (97,3%) eyes. Conclusion: Ultrasonography is useful part of ophthalmic examination for detection, evaluation and follow up of different vitreo-retinal pathologies.

Keywords: ophthalmic ultrasonography, vitreo-retinal pathology

1. INTRODUCTION

Imaging of the eye and orbit is facilitated by the use of the high frequency sound (8-10 MHz, 20 MHz, and 50-100 MHz) (1). First use of ultrasound in ophthalmology was in 1956. by Mundt and Hughes who used A-scan mode to evaluate an intraocular tumor (2), while Baum and Greenwood were first to introduce B-scan into the ophthalmology (3). In 1979. standardized echography was introduced to ophthalmology as a term that refers to combined use of contact B scan (Brightness modulation) and standardized A-scan (Amplitude modulation) for evaluation of ocular and orbital pathology (4).

Ultrasonography has developed significantly and is important diagnostic method if visualization of posterior eye segment is reduced and when pathology is clinically visible for monitoring of the disease progression. Although not providing the resolution of Ocular Coherence Tomography (OCT), high resolution ultrasound imagining can be used in the presence of optical opacities and allows evaluation of deeper tissue structures (5). Ultrasonography can provide highly accurate (up to 96%) clinically confirmed diagnosis in evaluation of posterior eye segment pathology (6).

Purpose of this study is to assess the diagnostic value of ultrasonography in the detection of vitreo-retinal pathologies.

2. MATERIAL AND METHODS

This prospective study included all patients from retina department in Eye clinic University Clinical Center Tuzla examined in period from January 2011. to January 2012. Patients included in this study were introduced for the first time in this department and examined by a single experienced vitreo-retinal surgeon. All patients who already had previous ophthalmic surgical interventions for different ophthalmic conditions or already had ophthalmic ultrasound examination prior to referral in retina department were excluded from this study. Included patients had complete ophthalmic examination with evaluation of anterior and if possible...
posterior eye segment, prior to ultrasoundography. Ultrasoundography—standardized echography (combined ultrasound A and B-scan) (4) was performed to all patients for detection and confirmation of vitreo-retinal pathology.

Ultrasoundography was performed on the machine Ultra Scan (Alcon, Fort Worth, USA). 0.5% tetracaine eye drops were used for local anesthesia and hydroxypropyl methyl cellulose as the coupling material. During the examination, patients were lying comfortably on the bed near the ultrasound machine, so that the examiner could see the eye and the monitor at the same time. Initial examination was performed under high gain (80dB) and it was followed with lower gain examination for more detailed inspection. Kinetic echography was performed by keeping the ultrasound probe still while the patient was asked to move his eyes in different gazes to determine the movements of membranous structures inside of the eye. Quantitative echography was performed to determine the internal reflectivity of solid lesions. All key findings of ultrasoundography were recorded and printed.

3. RESULTS

Study included 146 eyes from 122 patients in retina department of Eye clinic UCC Tuzla. 253 patients were excluded from this study. 65 (53.2%) patients were male gender and 57 (46.7%) female gender. Average age of all patients was 49.1±7.2 years, males 48.8 years and females 49.4 years. 71 right eyes and 75 left eyes were evenly distributed in both genders. Patients included in the study were classified in to two groups: with poor and with good posterior eye segment visualization.

Number of 58 (39.7%) eyes from 46 patients, had poor posterior segment visualization due to different ocular pathologies (Table 1). 21 (14.4%)–15 patients eyes had dense cataracts. 7 (4.8%) eyes had cataract due to previous ocular trauma (6 eyes had associated vitreous hemorrhage and 3 retinal detachments). 3 (2%) eyes with dense cataracts were associated with long history of diabetes mellitus (longer than 20 years), although referred to vitreo retinal surgeon, did not have posterior segment pathologies and had only cataract surgery with no later interventions. 5 (3.4%) eyes had retinal detachment under dense cataracts with 2 tractional retinal detachments also associated with vitreous hemorrhage. In 13 eyes with dense cataract and vitreous hemorrhages, 8 (5.4%) were newly formed (2 with posterior vitreous detachment–PVD, 3 had retinoschisis and 3 were associated with intraocular foreign bodies). 5 (3.4%) eyes had already organized vitreous hemorrhages, all associated with PVD.

31 patients - 37 (25.3%) eyes had predominantly vitreous opacities. In 27 eyes with vitreous hemorrhages, 20 (13.7%) were newly formed – 6 (4.1%) with PVD and 7 (4.8%) eyes had already organized vitreous hemorrhage all with PVD. 7 (4.8%) eyes with vitreous hemorrhages had associated tractional retinal detachment. 11 (7.5%) eyes had massive vitreous hemorrhages due to ocular trauma, with 5 cases of traumatic retinal detachment. 9 (6.2%) eyes had long history of intraocular inflammation which resulted with asteroid hyalosis in 3 (2%) cases.

In patients with poor visualization ultrasonography completely changed initial diagnosis and management plan in 5 eyes, subclassified the diagnosis and made adjustments in management plan in 11 eyes and confirmed already established diagnosis in 42 eyes. The final clinical diagnosis confirmed the ultrasonography diagnosis in 55 from 58 eyes.

88 (60.3%) eyes from 76 patients, had good or partial posterior eye segment visualization (Table 2). 67 (45.9%) eyes from 58 patients had proliferative vitreo-retinopathy, resulting from long duration of diabetes mellitus. Among 67 eyes with proliferative vitreo-retinopathy, 55 (37.7%) eyes had certain signs of tractional retinal detachment in ultrasonography (38 eyes had PVD), and 13 (8.9%) eyes had concomitant signs of small vitreous hemorrhages. In 4 eyes with PVR, clinical examination did not show signs of retinal detachment which was confirmed with ultrasound examination. 16 (10.9%) eyes had rhegmatogenous retinal detachment, all associated with complete PVD and with 6 (4.1%) eyes associated with high myopia and posterior staphyloma.

In patients with good visualization ultrasonography completely changed initial diagnosis and management plan in 2 eyes, subclassified the diagnosis and made adjustments in manage-
ment plan in 8 eyes and confirmed already established diagnosis in 78 eyes. The final clinical diagnosis confirmed the ultrasonography diagnosis in 87 from 88 eyes.

4. DISCUSSION

Ultrasonography is essential when visualization of posterior eye segment structures is difficult. These conditions include lid problems (severe edema, tarsorrhaphy), keratoprosthesis, corneal opacities (scars, severe edema), hypopyon, hyphema, different papillary membranes, refractory miosis, dense cataracts and various vitreous opacities (hemorrhage, inflammatory debris) (7, 8, 9, 10). Ultrasonography is used for diagnostic purposes when ocular pathology is clinically visible, while it can accurately image and measure intraocular structures. These conditions include differentiation of iris or ciliary body lesions, ruling out detachment of ciliary body, differentiation of intraocular tumors, serous versus hemorrhagic choroidal detachments, rhematogenous versus exudative retinal detachments, and optic nerve disc drusen versus papilledema (7, 8, 9, 10, 11).

In our study, 58 (39.7%) eyes had poor posterior segment visualization, 21 (14.4%) eyes due to dense cataracts and 37 (25.3%) eyes due to different vitreous opacities. 3 (2%) eyes with dense cataracts had no vitreo-retinal pathology, while all other referred patients had underlying posterior segment pathology and were planned for further vitreo-retinal surgical treatment. Routine ultrasound examination in patients planned for cataract surgery with dense cataract revealed posterior eye segment changes in 8.6 - 24.3% of eyes planned for cataract extraction (12, 13, 14). Our results show higher incidence of posterior segment pathology (85.7% - 18 from 21), because population included in the study had many patients with history of ocular trauma, inflammation and systemic diseases. 18 eyes with ocular trauma, showed higher rates of vitreous hemorrhages 17 compared to 8 retinal detachments. This data is different from results in previous ocular trauma studies which show low predominance of retinal detachments over vitreous hemorrhages, as most common posterior segment complications (15, 16).

Reason for this result might be that all trauma cases in this study were treated immediately after the trauma affected the eye and there was no time for late onset of the retinal detachment.

Approximately 70% of eyes with vitreous opacities show other posterior segment changes which is similar to our results (67.6% - 25 from 37). 3 (2%) eyes had intraocular foreign bodies that were successfully detected before the vitreo-retinal surgery, which is similar to previously reported results (16). 88 (60.3%) eyes had good or partial posterior eye segment visualization, where 67 (45.9%) eyes had proliferative vitreo-retinopathy. 10 (6.8%) eyes were diagnosed with tractional retinal detachment after the ultrasonography. 2 (1.3%) eyes had pieces of dropped nucleus after cataract extraction and there was one case of dropped IOL similar to previous reports (16). All eyes with rheumatogenous retinal detachment had associated PVD as reported earlier (17).

Ultrasonography confirmed suspected diagnosis and operative management plan in 120 (82.2%) eyes. On the other hand, ultrasonography established completely new diagnosis and changed initial plan in 7 (4.8%) eyes. In 19 (13%) eyes ultrasonography subclassified diagnosis and helped further operative planning. These results are similar to results from Scott et al. with 83% of confirmed diagnosis, 13% of subclassified and 8% of changed diagnosis and management planning (6). The final clinical diagnosis confirmed the ultrasonography diagnosis in 142 from 146 eyes (97.3%) eyes which is even higher than previously reported 96% (6).

5. CONCLUSION

Our results clearly show that ultrasonography is indispensable diagnostic tool for eyes with poor posterior segment visualization. On the other hand, in cases with partial and good posterior eye segment visualization, ultrasonography is excellent additional diagnostic tool for operative treatment planning and predicting possible visual outcomes and predicting of possible intraoperative findings and complications. Ultrasonography is useful part of ophthalmic examination for detection, evaluation and follow up of different vitreo-retinal pathologies.

REFERENCES