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Demographic, Clinical, Therapeutic and Evolutionary Features of Cataract in North-African Diabetic Population

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Authors' contributions

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

Background: Cataract is the leading cause of reversible blindness in the world and its treatment is the most common surgery in ophthalmology. Compared to the non-diabetic populations, cataract occurs earlier and more frequently in patients suffering from diabetes mellitus necessitating urgent operation to avoid a multitude of problems including the correction of the visual impairment as well as the accessibility of fundus examination to look after diabetic retinopathy and treat this latter by photocoagulation.
Aim: This study aims to highlight the difference of socio-demographic, clinical, therapeutic, and evolutionary features between a population of diabetic and non-diabetic patients using SPSS version 11.5 software to analyze the data.
Methods: Throughout our work, we compared the socio-demographic, clinical, therapeutic, and evolutionary characteristics between diabetic and non-diabetic populations who had received cataract surgery. It's a retrospective study of 2,000 patients, including 672 diabetics and 1328 non-diabetics in our ophthalmology department between January and December 2019.
Results: The average age in the diabetic group is lower than non-diabetic patients (62.5 versus 66.8 years) with a masculine predominance (61.7%). Preoperative visual acuity varies from light perception to 3/10 with a predominance of total white (28.2%). We usually performed cataract surgery by phacoemulsification (94.3%) under local anesthesia (99.7%). Intraoperative

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complications are infrequent and comparable between the two groups (p = 0.37), but postoperative complications, dominated by secondary cataract and macular edema, are more frequent in diabetics (p = 3.10-7).
Conclusion: Mean postoperative visual acuity was lower in diabetics (8.08 versus 7.36/ p = 0) especially in subjects suffering from diabetic retinopathy.

Keywords: Cataract; diabetes; phacoemulsification; retinopathy; macular edema.

1. INTRODUCTION

Cataract blindness is still one of the greatest public health challenges of the 21st century, especially in developing countries [1], that need sufficient surgical coverage as well as good surgical results to fight this disease.

Cataract surgery is among the most practiced procedures in Morocco, with more than 130.000 procedures performed every year. This procedure is more important in a population of diabetics to improve their visual acuity since cataract is a common cause of vision impairment in this population occurring earlier [2], and two to four times more frequently compared to non-diabetics [3]. This procedure also allows for both fundus examination and treatment of the main causes of blindness for diabetics, which are diabetic retinopathy and maculopathy, throughout photocoagulation therapy.

This study aims to describe and compare the socio-economic, systemic, ocular characteristics, and functional outcomes between diabetic and non-diabetic patients operated on for cataracts in a Moroccan population.

2. MATERIALS AND METHODS

This is a retrospective study of 2000 North-African patients who have been operated on for cataracts between January and December 2019. We collected the data from the medical records of these patients.

For each patient, we noted the socio-demographic, clinical, therapeutic, and evolutionary characteristics using Excel software to enter our data and SPSS version 11.5 software to analyze them. Quantitative variables were expressed as mean and Standard deviations for Median and Quartiles according to the distribution while qualitative variables were expressed in percentages and counts. Comparisons were made using the appropriate statistical test, and the significance level for all tests was set at 0.05.

Firstly, we noted the socio-demographic features including the sex and age of the patients. Then, we collected the medico-surgical history of each patient with a special focus on the ophthalmological comorbidities especially diabetic retinopathy except for the acute conditions that resolved without significant general consequences. Thereafter, we noted the findings of a complete preoperative ophthalmologic examination of both eyes including best-corrected visual acuity according to the Monoyer scale, tonometry, microscopic examination of the anterior segment and fundus after pupillary dilation. The general clinical examination was conducted by the anesthesiologist. Then we collected the operating technique information and the anesthesia type (peribulbar, sub-tenon, topical or general anesthesia). Finally, we noted the outcome of the cataract surgery for each patient based on postoperative ophthalmologic examination with best-corrected visual acuity after two months, as well as any possible postoperative complication.

3. RESULTS

We included 2000 patients who had been operated on cataract surgery in our ophthalmology department including 672 diabetics and 1328 non-diabetics from January to December 2019. The results of each feature were as follows.

3.1 Socio-Economic Characteristics

The mean age of the patients was 64.7 +/- 11.8 years (4 to 90 years). Among them, there were 766 female patients (38.3%) aged on average 63.0 +/- 11.7 years (13 to 90 years), and 1,236 male patients (61.7%) aged on average 65.7 +/- 11.7 years (4 to 86 years). The average age in the diabetic group was 62.5 years in opposition to 66.8 years for non-diabetics. (p = 0.69).

3.2 Clinical Characteristics

Systemic clinical Characteristics: The two most common general comorbidities were arterial hypertension in 718 patients (35.9%) and diabetes in 672 patients (33.6%), while 982 (49.1%) had no comorbidity.

Ocular comorbidities (Table 1) are frequent and dominated by chronic open-angle glaucoma (4.8%). Among the 1428 patients in whom the fundus was accessible; 278 presented at least one retinal pathology on preoperative examination: Non-proliferative diabetic retinopathy in 10% of the cases, proliferative diabetic retinopathy in 4,3% of the cases, and age-related macular degeneration in 1,4% of the cases. Otherwise, we noted a history of retinal detachment surgery in 10 cases, lacrimal tract surgery, and eyelid surgery in 8 cases.

During the preoperative ocular examination, the best-corrected visual acuity of the operated eyes was less than 1/10 on the Monoyer scale in 72.6% of cases, 19.1% had an acuity between 1/10 and 3/10 and 10.3 % had a best-corrected visual acuity superior to 3/10. There was no difference according to sex (p = 0.69) in terms of preoperative visual acuity, on the other hand, visual acuity was significantly lower in diabetics compared to non-diabetics (p = 1, 1 10-7). There was no difference in ocular pressure between non-diabetic and diabetic patients (13,20 versus 13,61/ p = 0,56); neither the frequency of antiglaucoma treatment (7,2% versus 6%). In the diabetic group, a poor iris dilation was noted in 238 (11,9 %) cases when versus only 62 (3,1%) cases in the control group. The different types of cataracts observed in the diabetic / non-diabetic group was distributed as follow: cortical (5.4% / 9.5%), nuclear (22.9% / 29.2%); total white (28.2% / 27.5%) and subcapsular (17.1% / 18.7%).

During cataract surgery, there was no statistically significant difference in the choice of the technique used on diabetic and non-diabetic patients (p=0,43). We exceptionally performed another technique than phacoemulsification (PE) despite the advanced nature of cataracts. Phacoemulsification with posterior chamber implantation (PCI) was performed in 1886 procedures (94.3%). We realized extra-capsular extraction in 108 cases, with 46 cases of which the indication was made initially during the preoperative examination and 62 cases of perioperative conversion. We also realized two combined PE-PCI-trabeculectomy and one intra-capsular extraction in a patient suffering from subluxated cataract after a traumatism. Regarding the type of anesthesia in the diabetic group, we used most widely topical and/or sub-Tenon anesthesia in 36.7% and 60.5% of the cases respectively. The anesthesia was peribulbar in 50 cases (2.5%) and exceptionally general for 6 children (0.3%). All the patients were hospitalized according to the traditional method (admitted the day before the operation and discharged the next day).

Table 1. Main comorbidities (NB: Retinal disease expressed only for patients in whom fundus examination is possible)

Associated pathologies	Number of patients
Primary open-angle glaucoma	96
Non-proliferative diabetic retinopathy	144
Proliferative diabetic retinopathy	62
Aged macular degeneration	20
Ocular traumatisme	12
Corneal dystrophy *corneaguttata*	227
Uveitis	29
Capsular pseudo-exfoliation	68
Lacrimal system and eyelids diseases	7
Dry syndrome	28
Optic neuropathy	3
High myopia	19
Retinitis pigmentosa	3
Epi-macular membrane	5
Retinal hole / tear treated by photocoagulation	6
Retinal vein branch oclusion	1
Total	**532**

In regards to complications, we reported 104 intraoperative incidents: 22 cases of capsular ruptures in diabetic patients and 45 in non-diabetic patients, of which 14 required anterior chamber implantation. There were 6 cases complicated by posterior lens dislocation and 17 cases of zonular disintegrations; but their occurrence was statistically significantly related to capsular pseudo-exfoliation (p = 0,002) rather than statistically related to diabetes (4,1%/4,6%) p=0, 37. Post-operative complications occurred in 214 cases (10,7 %), dominated by a secondary cataract (39 cases: 27 diabetics /12 non-diabetics) and macular edema (30 cases: 23 diabetics /12 non-diabetics) especially in diabetics with diabetic retinopathy (p = 3.10-7).

On the other hand, there was a statistically significant difference in the diabetics' group between pre- and postoperative visual acuity with an average gain of 6.6 lines (p <0,01). Preoperative visual acuity in the witnessed group of non-diabetics was 2,02/10, and 8,84/10 postoperatively at 3 months (gain of 6.8 lines; p <0.01). If we compare the two groups, there was a statistically significant difference in the preoperative visual acuity (2,02/0,74 p=0). Likewise, the mean postoperative visual acuity was lower for diabetics (8,84/7,36 p= 0) and the visual function recovery was less important for subjects that present diabetic retinopathy preoperatively with a gain of 6,15 lines on average among non-proliferative diabetic retinopathy and 5,5 among proliferative diabetic retinopathy (Fig. 1).

Table 2 summarizes the comparison of the different variables between the two populations' diabetics versus non-diabetics.

4. DISCUSSION

Diabetes is a more common systemic disease, and numerous subjects soliciting cataract surgery suffer from concomitant diabetic eye disease. Even if the cataract surgery outcomes could be irreproachable, these patients are at an increased risk of complications and consequent limitations of vision.

Regarding socio-economic characteristics, the sex ratio of our series was 1.6. The mean age of our population who had cataract surgery was comparable to international averages for patients. [4,5] The age distribution showed that 25% of patients were over 73 years old, and the diabetics operated in our series were younger (62.5 / 66.8).

The combination of diabetes and cataracts constitutes an additional risk of the development of pre-and postoperative complications [6,7]. Due to the development of microsurgery and the advent of phacoemulsification, these complications have become less frequent. Loco-regional anesthesia was the most used procedure; it allows surgery on people with anticoagulant treatment without having to stop neither modify it, always disruptive for an elderly person. We only had recourse to general anesthesia in 6 cases, all of them were children.

In our series, we observed that white cataract was the most frequent cataract for diabetics, which requires a prolonged time as well as high ultrasound power, [8] responsible for corneal edema the day after the intervention. Regarding the rate of intraoperative complications, we have 6.1% capsular and zonular rupture in the white cataracts group while there is only 4% in the control group. Several studies have shown that the rate of capsular ruptures varied from 0.4 to 5% in classical cataracts series. [9,10] We have not observed any corneal burns or endothelial decompensation even after operating white cataracts. Moreover, postoperative visual acuity is lower in diabetics than in non-diabetics.

Indeed, this does not depend only on the surgical technique but also on many other factors in particular the retinal status. [6]

In our study, the preoperative BCVA was very low, 72.6% had visual acuity less than 1/10 which corresponds to the level of legal blindness testifying to a late recourse of medical care by Moroccans; this visual acuity increased to more than 7/10 in 70.2% of postoperative cases. These results are comparable to those of non-diabetic patients and superior to those of the literature reported in developing countries. [11,12,13] Somaiya and al. [14] found that the main factor affecting postoperative visual acuity was the preoperative stage of diabetic retinopathy. In fact, patients are five times less lucky to achieve acuity greater

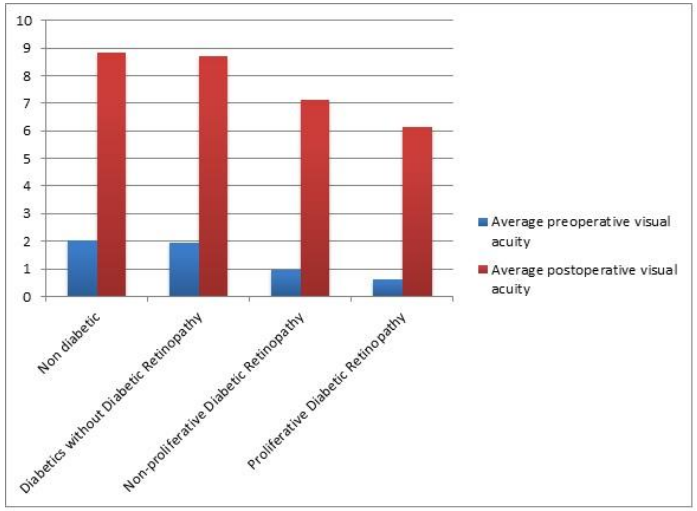

Fig. 1. Comparison of pre and postoperative visual acuity

Table 2. Comparisons of different data between diabetic and non-diabetic patients

Variables	Diabetic Patients Effectif (%) Average ± Standard deviation	Nondiabetic Patients Effectif (%) Average ± Standard deviation	*p*
Age (years)	62,5 ± 9,9	66,8 ± 12,6	0,69
Average preoperative visual acuity	2,02/10	0,74/10	$1,1\ 10^{-7}$
Intra-ocular pressure	13,61 ± 3,1	13,20 ± 3,2	0,56
Poor iris dilation	238 Effective (35,4%)	62 Effective (4,6%)	<0,05
Most common type of cataract	White total (28,2%)	Nuclear (29,2%)	0,058
Surgical technique	PE : 94,6%	PE : 94%	0,43
Intra-operative complications	309 (4,6%)	54 (4,1) %	0,37
Occurrence of secondary cataract	27 cases (4%)	12 cases (0,9%)	0 ,009
Macular edema	23 (3,4%)	12 cases (0,9%)	$3.\ 10^{-7}$
Average postoperative visual acuity	8,84 ± 1,9	7,36 ± 1,9	$1,1\ 10^{-29}$

than 5/10 in the presence of non-proliferative diabetic retinopathy and 30 times less in the case of proliferative diabetic retinopathy compared to non-diabetic patients. [6] Wagner and al. [15] found that visual acuity is greater than 5/10 in 79% of the cases in the absence of diabetic retinopathy, in 59% of cases in the presence of non-proliferative diabetic retinopathy, and only in 26% of cases in case of proliferative diabetic retinopathy. In our series, the results were comparable to the previous ones: with visual acuity> 5/10 in 94.5% of cases in the absence of diabetic retinopathy, with 82.1% of cases in the presence of non-proliferative diabetic retinopathy and only with 67.8% of cases if proliferative diabetic retinopathy.

In diabetic patients, cataract surgery is associated with a higher incidence of postoperative complications, including nonetheless a higher risk of endophthalmitis, [16] fibrinous uveitis, [17] opacification of the posterior capsule, [18] neovascularization of the anterior segment, [19] but especially of the development and the aggravation of retinopathy [20-22] and diabetic macular edema. [14,21,22-24] In our series, there is only one case of endophthalmitis occurring in a diabetic under insulin therapy for 26 years, and the appearance of secondary cataracts was 4.5 times more frequent in diabetics.

The more advanced the stage of diabetic retinopathy, the greater the risk of developing complications, especially diabetic macular edema. [25,26] In fact, for Viganelli and al., [27] the risk of appearance and aggravation of diabetic macular edema decreases from 7% in the absence of diabetic retinopathy to 23% in the presence of diabetic retinopathy, for us the risk has passed from 3.7 to 14.4%.

Recently, Ostri and al. [28] showed that the amelioration of visual acuity of diabetic patients after cataract surgery by phacoemulsification was significant ($p < 0,001$) with an estimated rate of 75%, without correlation of age or diabetic retinopathy stages. According to this study, the apparent worsening of diabetic retinopathy was due to the ignorance of the early stages of retinal damage because of the poor visibility of the fundus caused by the cataract.

5. CONCLUSION

The indication for cataract surgery, more common for diabetics, should be given with care. The visual prognosis is darker in the event of concomitant diabetic retinopathy and complications are more frequent in this case, especially macular edema. The growing increase in the demand for surgery in the coming years makes cataract a major public health issue. The improvement in operative techniques and surgical skills makes this approach particularly suitable in our specialty for obtaining satisfactory functional results; supplemented by a good follow-up allowing the initiation of adequate retinal treatments.

CONSENT

It's not applicable.

ETHICAL APPROVAL

It's not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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