Fuchs endothelial corneal dystrophy (FECD) is a bilateral inherited eye disease with advanced forms only treatable by corneal transplantation. The pathogenesis of FECD has not been worked out yet, however, trinucleotide repeat polymorphism CTG18.1 in the TCF4 gene has recently been associated with late-onset FECD. Gene expression profiling of corneal endothelium with and without this expansion can help elucidate molecular mechanisms of the disease development. Current data article represents whole transcriptome files of corneal endothelium obtained from 12 patients with FECD and 6 control tissues from eye bank donors. RNA sequencing data is available at NCBI Sequence Read Archive under Accession No. PRJNA524323. In addition, each patient and donor were genotyped for CTG18.1 expansion and the corresponding numbers of CTG repeats in the TCF4 gene are provided within this article. The dataset includes samples from FECD patients both with and without CTG18.1 expansion.

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1. Data

The dataset contains raw sequencing data obtained through the transcriptome sequencing of corneal endothelium from 12 patients with FECD and 6 donors. The data files (reads in FASTQ format) were deposited at NCBI SRA database under project accession No. PRJNA524323. Information about tissue samples collected from patients with FECD and control samples from donors is presented in Table 1 and Table 2, respectively.

All patients and donors were also characterized by genotyping for trinucleotide repeat polymorphism CTG18.1 in the TCF4 gene (Table 3).

2. Experimental design, materials, and methods

2.1. Ethical statements

This study was approved by the Institutional Review Board of The S. Fyodorov Eye Microsurgery Federal State Institution and was carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki).

2.2. Collection of tissue and blood samples from FECD patients

Samples of corneal endothelium were obtained from patients diagnosed with FECD and undergoing corneal transplantation at The S. Fyodorov Eye Microsurgery Federal State Institution. All patients included in this study had signed an informed consent form. Table 2 summarizes information about
### Table 1
Samples of corneal endothelium obtained from patients with FECD.

| Sample ID | Age, years | Sex | Diagnosis | FECD stage | Comorbidities | CEC (corneal endothelial cell) density | Time between cataract surgery and endothelial keratoplasty |
|-----------|------------|-----|-----------|------------|---------------|---------------------------------------|----------------------------------------------------------|
| Dfu_201   | 70         | f   | OD FECD   | stage II   | Complicated cataract  |
| Dfu_202   | 63         | m   | OD FECD   | stage II   | Complicated cataract  |
| Dfu_203   | 57         | f   | OS FECD   | stage II   | Complicated cataract  |
| Dfu_205   | 64         | f   | OS FECD   | stage II   | Complicated cataract  |
| Dfu_207   | 79         | f   | OS FECD   | stage II   | Complicated cataract  |
| Dfu_209   | 56         | f   | OD FECD   | stage IV   | Neovascularization, Pseudophakia |
| Dfu_210   | 64         | m   | OD FECD   | stage II   | Complicated cataract  |
| Dfu_212   | 72         | f   | OS FECD   | stage III  | Pseudophakia       |
| Dfu_213   | 74         | m   | OS FECD   | stage II   | Complicated cataract  |
| Dfu_215   | 70         | f   | OD FECD   | stage II   | Complicated cataract  |
| Dfu_217   | 57         | f   | OD FECD   | stage III  | Complicated cataract  |
| Dfu_219   | 69         | f   | OD FECD   | stage II   | Complicated cataract  |

* The cataract was classified as complicated if the patient had any other concomitant eye disease, which was FECD for all patients from this sample group.

### Table 2
Control samples of corneal endothelium obtained from donors.

| Sample ID | Age, years | Sex | Cause of death              | CEC density |
|-----------|------------|-----|-----------------------------|-------------|
| C_201     | 47         | f   | Cardiomyopathy              | 2976        |
| C_203     | 63         | m   | Asphyxia                    | 2864        |
| C_205     | 54         | f   | Acute cardiovascular insufficiency | 2924       |
| C_206     | 65         | f   | Acute cardiovascular insufficiency | 2931       |
| C_207     | 64         | f   | Acute cardiovascular insufficiency | 2789       |
| C_208     | 61         | m   | Acute cardiovascular insufficiency | 2812       |

### Table 3
The data on genotyping patients with FECD and donors for CTG18.1 expansion.

| Sample ID | Sample group | TCF4 expansion status | Number of expanded TCF4 alleles | Number of repeats in smaller TCF4 allele | Number of repeats in larger TCF4 allele |
|-----------|--------------|-----------------------|---------------------------------|------------------------------------------|----------------------------------------|
| Dfu_201   | FECD         | expanded              | 1                               | 12                                       | 156                                    |
| Dfu_202   | FECD         | expanded              | 2                               | 12                                       | 72                                     |
| Dfu_203   | FECD         | expanded              | 2                               | 12                                       | 72                                     |
| Dfu_205   | FECD         | expanded              | 1                               | 11                                       | 87                                     |
| Dfu_207   | FECD         | expanded              | 1                               | 11                                       | 87                                     |
| Dfu_209   | FECD         | non-expanded          | 0                               | 11                                       | 14                                     |
| Dfu_210   | FECD         | non-expanded          | 0                               | 11                                       | 14                                     |
| Dfu_212   | FECD         | expanded              | 1                               | 14                                       | 44                                     |
| Dfu_213   | FECD         | expanded              | 1                               | 14                                       | 104                                    |
| Dfu_215   | FECD         | expanded              | 1                               | 21                                       | 114                                    |
| Dfu_217   | FECD         | non-expanded          | 0                               | 14                                       | 17                                     |
| C_201     | Control      | non-expanded          | 0                               | 15                                       | 17                                     |
| C_203     | Control      | non-expanded          | 0                               | 14                                       | 18                                     |
| C_205     | Control      | non-expanded          | 0                               | 11                                       | 18                                     |
| C_206     | Control      | non-expanded          | 0                               | 11                                       | 17                                     |
| C_207     | Control      | non-expanded          | 0                               | 11                                       | 15                                     |
| C_208     | Control      | non-expanded          | 0                               | 17                                       | 17                                     |
tissue samples collected from patients with FECD. Disease stage was identified according to the Volkov and Dronov classification as described in Ref. [1].

During the endothelial keratoplasty procedure, circular descemetorhexis with a diameter of 7–8 mm was performed using a special hook to obtain samples of corneal endothelium/Descemet’s membrane (CEC-DM) complex. RNA in CEC-DM complex was stabilized using RNaLater solution (ThermoFisher Scientific, USA) according to the manufacturer’s instructions. Venous blood (4–6 mL) was collected from each patient into vacutainer tubes with EDTA (Becton Dickinson, USA). Blood samples were stored at −20 °C prior to DNA extraction.

2.3. Collection of control tissue samples from donors

Control samples of corneal endothelium were collected at the Eye Bank of The S. Fyodorov Eye Microsurgery Federal State Institution. Donor samples were selected from those not suitable for corneal transplantation. Information about control tissue samples collected from donors is presented in Table 3.

The eyeball was stored for a maximum of 1 day before extraction of the corneoscleral disk which then was kept in a preservative medium for the period of up to 12 hours. The preservative medium contained: 25% of medium 199, 25% of F-10 medium, 45.3% of DMEM, 2% dextran, 2.7% chondroitin sulfate, gentamicin sulfate 0.00014%, amphotericin B 0.00015%. Afterward, the corneoscleral disk was placed in an artificial anterior chamber endothelial side up. Circular excision of CEC-DM complex 7–8 mm in diameter was performed using spatula and tweezers. After isolation, the donor CEC-DM complexes were immediately immersed in the RNaLater solution (ThermoFisher Scientific, USA). Iris samples were also collected from donors for the TCF4 repeats expansion genotyping.

2.4. CEC density measurement

The density of corneal endothelial cells was measured using Tomey EM-3000 Specular Microscope (Tomey, USA). The shooting method was non-contact, the measurement mode was manual/automatic, the shooting area was 0.25 mm × 0.54 mm with 7 capture points (central + 6 points on the periphery). The accuracy of corneal thickness measurement was ±10 nm. CEC density was evaluated if at least one of the capture points had enough transparency for the analysis.

2.5. DNA extraction

DNA was isolated from thawed blood samples with Gentra Puregene Blood Kit (Qiagen, Germany) according to the manufacturer’s protocol. DNA was resuspended in a low TE buffer to a final concentration of 10 ng/μl. DNA from iris samples was extracted using ZR Genomic DNA Tissue MiniPrep (Zymo Research, USA).

2.6. Genotyping

Identification of the number of CTG repeats within the CTG18.1 allele in the TCF4 gene was carried out using short tandem repeat (STR) and triplet primed PCR (TP-PCR) techniques exactly according to the procedure described in Ref. [1]. The TCF4 allele was classified as expanded if the number of CTG repeats was >40 according to previously reported literature [2,3].

2.7. RNA extraction

Disruption and homogenization of tissue samples were performed with TissueRuptor II (Qiagen, Germany). The time of homogenization was 20 seconds. Total RNA was isolated using RNeasy Micro Kit (Qiagen) following the manufacturer’s protocol. Traces of DNA were removed with TURBO DNA-free Kit (ThermoFisher Scientific). RNA concentration was assessed using the Qubit 2 instrument (Invitrogen, USA) with Qubit HS RNA Assay Kit (ThermoFisher Scientific, USA). The quality of total RNA expressed as RNA Integrity Number (RIN) was determined with Bioanalyzer 2100 instrument (Agilent, USA) using an
2.8. Transcriptome library preparation and sequencing

Ribosomal RNA was depleted using NebNext rRNA Depletion Kit (Human/Mouse/Rat) (New England Biolabs, USA). Transcriptome libraries were constructed with NEBNext Ultra II Directional Library Prep Kit for Illumina (New England Biolabs, USA) and Multiplex Oligos for Illumina (96 Indexes) (New England Biolabs, USA). The resulting paired-end libraries were sequenced on the Illumina HiSeq 2500 instrument with 2 × 125 cycles using HiSeq SBS Kit v4 (Illumina, USA).

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Transparency document

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