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ARTICLE

Psychosurgery: A History from Prefrontal Lobotomy to Deep Brain Stimulation

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ABSTRACT

Neurosurgical treatment for psychiatric disorders features a long and controversial history. This article explores a "spectrum of psychosurgery", describing how old-fashioned and controversial prefrontal lobotomy gradually evolved into modern day, mainstream scientific deep brain stimulation (DBS). We focus on the rise, fall and possible re-emergence of psychosurgery as a therapeutic intervention today. We journey through historic indiscriminate use of prefrontal lobotomy, which evoked stern criticism from both public and professionals, through to the development of modern day DBS - performed for patients suffering from severe, treatment resistant symptoms of obsessive-compulsive disorder (OCD), epilepsy and movement disorders. We hope this article will provide a basis for understanding the availability of existing treatment options and potential future opportunities, whilst simultaneously challenging any public/professional preconceptions of psychosurgery, which may indirectly be obstructing patient care. Additionally, we carried out a qualitative survey displayed in WordCloud Format, capturing the intellection of 38 mental health professionals working for North West Boroughs NHS Healthcare Foundation Trust, on "psychosurgery", "prefrontal lobotomy" and "DBS", which may well reflect wider public opinion. In summary, the article provides a brief, yet comprehensive overview of the controversial history of psychosurgery, present-day practice, and future trends of neurosurgery for psychiatric disorders.

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1. Introduction

Psychosurgery...what comes to your mind when you hear this word?

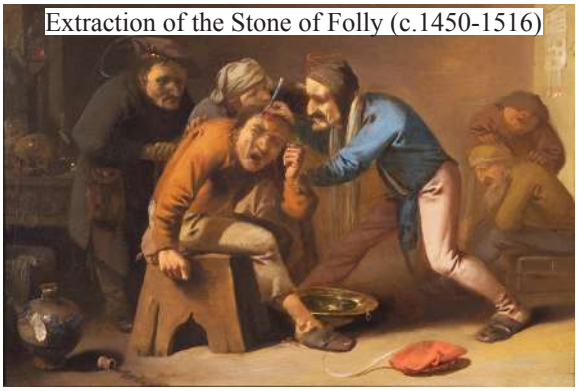

Figure 1. Extracting the Stone of Madness [45]

Does it bear resemblance to this portrayed image? Do words like "barbaric", "zombie" or "inhumane" spring to mind? Or perhaps the idea that it is useless and illegal?

Neurosurgery for psychiatric disorders has relished enthusiastic support as well as facing scorn throughout human history. Any discussion unvaryingly evokes controversy due to its indiscriminate use in the mid-twentieth century, resulting in profound ethical implications that remain to this day. Currently, the standard therapeutic approach to most psychiatric diseases involves either (or a combination of) psychotherapy, pharmacotherapy, and electroconvulsive therapy (ECT) in some cases. Despite these treatment methods, many patients still fail to respond effectively and continue to remain severely disabled. Most patients and their families are unaware that such "last-resort" options like psychosurgery still exist. In intractable cases, surgical intervention may be considered suitable if the therapeutic result and overall level of functioning could be enhanced [3].

Interestingly there is evidence of brain surgery successfully treating "organic" disorders such as epilepsy. According to a survey by physicians at Henry Ford Hospital, brain surgery for otherwise hard to treat epilepsy was found be an effective treatment for up to 15 years. Most prior studies had solely looked at seizure control and psychosocial outcomes at 2-5 years post-surgery [42].

Such procedures for "organic" brain disorders are just as invasive and associated with similar risks as psychosurgical techniques for "functional" illnesses, however we suspect that its evolution has been far less controversial - why?

This article explores a "spectrum of psychosurgery", describing how old-fashioned and controversial prefrontal lobotomy gradually evolved into modern day, mainstream scientific deep brain stimulation. It also explores the perceptions of medical professionals on psychosurgery, which may reflect wider public opinion and stigma. To explore this we asked a group of 38 psychiatrists and psychiatry trainees working for North West Boroughs NHS Healthcare Foundation Trust, to write down 3 words reflective of their intellection about "psychosurgery (Figure 4), prefrontal lobotomy (Figure 2), and deep brain stimulation (Figure 10)". We have displayed their responses visually as word clouds below, embedded into sections of relevant discussion, with the size of the font directly corresponding with the frequency of responses.

2. A Spectrum of Psychosurgery from Prefrontal Lobotomy to DBS

2.1 Prefrontal Lobotomy Word Cloud

Figure 2. NWBH 38 psychiatrists "3 word" response to "Prefrontal lobotomy" [46]

The earliest evidence of psychosurgery has its roots in the Neolithic era of the stone age (around 5100 BC) [4]. During this period, numerous skulls were identified with areas of trephination and evidence of proper healing. The estimated long lifespan of these individuals, suggests that these early procedures were likely performed with therapeutic intent, rather than a traumatic origin of the wound [5]. It has been hypothesized that early trephination was performed for ritualistic or spiritual purposes, with intent to treat manifestations of headaches, epilepsy, and mental illness [6].

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Figure 3. Skull showing holes made by trephination process - clearly begun to heal, suggesting that although highly dangerous, the procedure was by no means fatal [47]

In the early 1800s, new insights into functional neuroanatomy and neurophysiology stimulated renewed interest into psychosurgery. In 1819, Franz Joseph Gall published his treatise on phrenology, which suggested that the brain possessed discrete functional regions [7]. He divided the brain into sections that corresponded to certain behaviours and traits that he called fundamental faculties. He based his structure-function association primarily on cranial differences between men and women [8].

Despite the idea of phrenology being flawed and eventually disgraced, Paul Broca and Carl Wernicke stretched the idea of neurological functions having an anatomical link in seminar work. This notion was further expanded by work of Gustav Fritsch, Eduard Hitzig, and David Ferrier on localization of the motor cortex [6].

When discussing traumatic brain injury, it is pertinent to recall the famous case of Phineas Gage, an American railroad construction worker, who developed personality changes (aggressive and impulsive behaviour, along with the defect in rational decision making and emotions processing) following an accidental penetrating injury to his left frontal lobe [9].

A Swiss psychiatrist named Gottlieb Burckhardt, performed the first psychosurgical procedures as early as 1888, after gaining inspiration from Phineas Gage's case findings. He conducted these procedures on six chronic schizophrenic patients and excised their cerebral cortices, which was thought to be responsible for aggression, agitation and hallucinations. Most patients showed improvement and became easier to manage, although one patient died from the procedure and some had aphasia or seizures [10]. He published his findings in 1891 in a scholarly paper; however, his approach outraged the medical community, calling him ruthless and irresponsible. This led to cessation of his academic endeavours [11]. The research and quest of psychosurgery became invisible until 1935, when Yale psychologists John Fulton and Carlyle Jacobsen presented a study on frontal lobectomy in primates and described the role of the frontal lobe in short term memory, anxiety and aggression [12].

2.2 Psychosurgery Word Cloud

Figure 4. 38 psychiatrists "3 word" response to "Psychosurgery" [48]

Egas Moniz, a Portuguese neurologist, along with neurosurgeon Almeida Lima developed a procedure called leucotomy (lobotomy) for the treatment of psychiatric patients with prominent depression, anxiety or aggression. The first lobotomy was performed on November 12th, 1935 by Almeida Lima, on the orders of Egas Moniz [13]. Their patient was a psychotic woman in her sixties, and Lima treated her by piercing her skull with a bone drill and killing frontal lobe brain tissue with an injection of alcohol. Moniz called this procedure a "prefrontal leucotomy" [14]. Between November 1935 and February 1936, Moniz and Lima performed lobotomies on nineteen more patients [15]. During this time, they revised their surgical technique and began using an instrument called a leucotome to destroy tissue in the frontal lobes [16]. Leucotomy had the best results on patients with agitated depression and involutional melancholia, the majority of whom Moniz classed as "greatly improved" [17]. Moniz and Lima also discovered that the procedure did not remove the symptoms of psychosis or improve obsessive-compulsive symptoms, much like other therapies. However, Moniz considered the operation to be an overall success, since patients became calm and were often discharged from hospital [18].

Leucotomy was introduced into the United States in 1936 by the neurologist Walter Freeman and the neurosurgeon James Watts [19]. They performed their first operation on September 14th, 1936. The patient, "A.H.", was a

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middle-aged woman with severe agitated depression [20]. Although Freeman noted that the long-term effects of frontal lobe damage were unknown, the patient was "relieved" of her agitation and depression. Freeman and Watts originally used Moniz's leucotomy technique before altering it to develop the standard lobotomy. This was a blind procedure which involved drilling into the skull near the top of the forehead, and then using a cannula (a sharp-ended tube) and leucotome to make "sweeping motions" and "stab incisions". This was done on both sides of the head with the patient potentially still awake [21,22]. This advanced procedure was termed the prefrontal lobotomy. Minimal lobotomies were mainly performed for the treatment of affective symptomatology, while radical lobotomies were for schizophrenic patients or those with refractory symptoms [23].

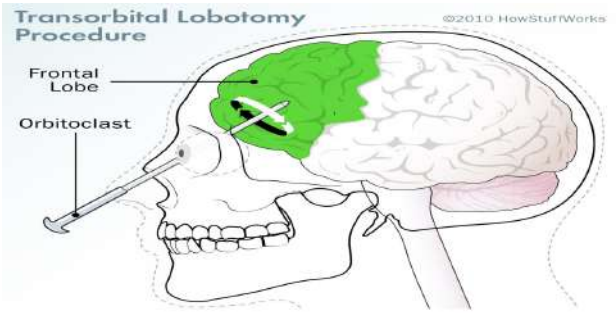

Figure 5. Transorbital Lobotomy Procedure [49]

Between January and March of 1946, Freeman began performing "transorbital" or "ice-pick" lobotomies. This process involved destroying frontal lobe tissue by moving around a cannula that was inserted into the brain through the bony orbit above the eye (Figure 5) [24]. Transorbital lobotomy destroyed less total brain tissue than the standard prefrontal leucotomy, and, according to Freeman, did not produce any "significant intellectual or personality deficits". Freeman promoted the transorbital approach as a "safe, simple, and quick" minor operation that merely required electroshock therapy for sedation. Hence psychiatrists could perform this without a neurosurgeon, anaesthetist or even proper sterile technique [25]. By 1952, when anti-psychotic drugs were introduced as a psychiatric treatment, Freeman and Watts had performed over 600 surgeries [26].

Figure 6. Lobotomy Tool Set consisting of a Hammer and Orbitoclast [50]

Figure 7. Dr Walter Freeman performing a transorbital lobotomy [51,52]

Leucotomy was gradually introduced in Britain in 1941 and was used more rapidly after World War II. By November 1961, 15,000 or more patients had reportedly received the operation [27]. Even before the introduction of chemical treatments in the early 1950s, leucotomy numbers slowed down nationally, possibly due to adverse side effects [28].

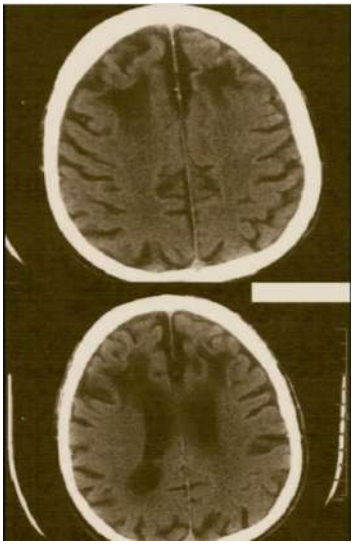

Figure 8. A CAT scan of a brain after leucotomy. The hypodense areas at eleven and one o'clock show the damage [53]

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Ultimately, the opinion of professionals and public turned against the lobotomy owing to the link of morbidity and mortality becoming more obvious [22]. A number of patients developed symptoms like apathy, emotional blunting, and disinhibition; which was jointly named as "post-leucotomy syndrome". Consequently, the medical association instigated to obtain further scientifically rigorous surgical methodologies, which were focused on hypothesis-driven targeting, with less hostile wounds and resections.

Due to the early enthusiasm for frontal lobe lobotomy and its widespread social acceptance, the non-neurosurgeons started performing this procedure in inappropriate settings. This sparked professional criticism regarding the substantial underreported adverse events, along with the lack of scientific rigor [29]. Additionally, the public became conscious of the objectionable consequences of lobotomies; and social attitudes were moulded by damaging portrayals in literature and film, including noteworthy examples such as *One Flew Over the Cuckoo's Nest*. It also came to the light that some institutionalized or incapacitated patients had lobotomies done without their informed consent, and that it may have been performed on prisoners to tackle dysfunctional behaviour rather for treating mental illness [23].

Ultimately, it was the growth of pharmacotherapy that turned the tide against psychosurgery, predominantly with the arrival of lithium [30] and chlorpromazine [31]. Although, electroconvulsive therapy (ECT) was also initiated before the arrival of psychotropics, and was documented as being efficacious in the treatment of psychiatric disorders, its use had also dramatically shrunken before 1980s, due to its side effects on cognition and memory [32].

However despite psychotropics, psychotherapies and ECT interventions, it became clear that a significant number of patients were not responding to these treatments, and psychosurgery was either being overlooked or not considered at all.

The success of the cardiac pacemaker, gave the public "the notion of an implantable device legitimacy and appeal" [43], and the subsequent development of present-day deep brain stimulation (DBS) is largely attributed to Alim Benabid. In the late 1980s, he discovered that the symptoms of Parkinson's disease improve massively following electrical stimulation of basal ganglia [33]. This neurosurgical procedure involved the placement of a neurostimulator (sometimes referred to as a "brain pacemaker"), which sent high-frequency electrical impulses through implanted electrodes deep in the brain, to specific brain areas responsible for the symptoms of each disorder [34].

Deep brain stimulation emerged as a neurosurgical treatment modality from ablative stereotactic neurosurgery. It nearly became extinct following the introduction of antipsychotics for psychiatric disorders and levodopa for Parkinson's disease. However, it soon became clear that a suggestive number of patients either had intolerable side effects or inadequate response to pharmacotherapy, which gave credence for consideration of invasive surgical interventions like deep brain stimulation in patients suffering significant functional impairment.

Figure 9. Deep Brain Stimulation procedure [54]

Today DBS is used in a variety of conditions. It is currently approved by the U.S. Food and Drug Administration (FDA) to treat refractory Parkinson's disease, primary dystonia, intractable seizures, essential tremors and chronic cluster headaches [35]. The use of DBS in Parkinson's disease and essential tremor has proved so effective that it has been licensed as a treatment option [36]. This well-known procedure has now been used for more than 20 years, and despite the invasive nature, it is linked with minimal adverse effects.

DBS has also successfully treated patients suffering from various intractable psychiatric disorders. Severe, treatment-resistant obsessive-compulsive disorder (OCD) is a chronic, incapacitating disorder, imposing substantial suffering and significantly impairing affected individuals' ability to work, interact socially, or live independently. DBS drastically reduces the symptoms of severe OCD, by stimulating either Ventral Capsule (VC) or anteromedial subthalamic nucleus (amSTN), according to a study in Biological Psychiatry [38].

Furthermore, DBS has emerged as a prospective option for select Tourette syndrome patients whose motor and/or vocal tics impact the quality of life ominously, despite maximal use of other treatment options. The implantation of electrodes in three target areas (nucleus accumbens as part of the ventral striatum, globus pallidus internus and thalamus), all of which have proved effective [39].

An interesting study was published in the American Journal of Psychiatry on Friday October 4 2019, which found that deep brain stimulation of subcallosal cingulate

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(SCC) area in the brain provides a robust antidepressant effect, that is sustained over a long period of time in patients with treatment-resistant depression [40]. New findings were made by a team of researchers led by Dr. Andres Lozano at the Krembil Neuroscience Centre (KNC) of Toronto Western Hospital (TWH). They provided further insight into the effects of Deep Brain Stimulation in the treatment of Alzheimer's disease [41].

3. Deep Brain Stimulation WordCloud

Figure 10. 38 psychiatrists "3 word" response to "Deep Brain Stimulation" [55]

4. Qualitative Survery of North West Boroughs Healthcare (NWBH) professionals regarding "Psychosurgery", "Prefrontal lobotomy" and "Deep Brain Stimulation"

We conducted a survey at NWBH NHS healthcare foundation trust, capturing the intellection of 38 mental health professionals. The survey was done in joint academic round, and 3 separate survey papers were distributed, with professionals asked to write 3 words that come to their minds when they heard the terms "psychosurgery", "prefrontal lobotomy" and "deep brain stimulation". Two minutes were provided, in order for instinctive conscious/unconscious responses to be recorded. The survey papers were then collected, and the results are displayed using word cloud format (Figure 4,2 & 10). The larger the font, the more popular that word response was.

5. Conclusion

The results of our survey demonstrated that 38 NWBH professionals commonly viewed Psychosurgery as "barbaric, controversial, extreme", and prefrontal lobotomy as "barbaric, cruel and outdated", amongst other responses.

Deep Brain Stimulation was viewed in a somewhat more favourable positive light, with common responses being "innovative, futuristic and associated with treatment for depressive and Parkinson's disease".

Why was this?

Was it because the clinicians thought that the emergence of better scientific evidence and neuroimaging techniques to guide such procedures makes DBS safer?

We found these results interesting, as DBS is still a significantly invasive procedure. DBS still involves drilling holes into to the skull, with invasive electrodes being implanted on (usually) both sides of the brain. Such procedures are no less likely to cause complications such as bleeding and/or infection.

We also suspect that the use of brain surgery for "organic" brain disease has been far less controversial than for "functional" brain disorders? If so, then why?

The NHS Commissioning Board (NHS CB) commissions Deep Brain Stimulation for patients with Parkinson's disease, tremor and dystonia in accordance with the eligibility criteria [44]. Presently, we don't see this happening for functional disorders. Why is this? These are the questions which began surfacing in our minds whilst writing this article.

Our take home message is that as clinicians we must examine, unpick and confront any possible preconceptions and cognitive bias in our conscious/unconscious minds regarding psychosurgery, as we are potentially denying patients suffering from distressing intractable symptoms a viable treatment option.

Conflict of Interest

Authors report no conflict of interest.

MCQ's

1. Burckhardt performed the first psychosurgical procedures on patients suffering from which psychiatric disorder?

(1) Depression
(2) Obsessive Compulsive Disorder
(3) Schizophrenia
(4) Epilepsy

2. The first prefrontal leucotomy technique was carried out by which technique?

(1) Killing frontal lobe tissue with an injection of alcohol
(2) Killing frontal lobe tissue with a leucotome instrument
(3) Killing frontal lobe tissue with an ice pick
(4) Killing frontal lobe tissue with an injection of acid.

3. Which noteworthy film may have contributed to moulding of social attitudes to lobotomies?

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(1) A Beautiful Mind
(2) Shutter Island
(3) The Snake Pit
(4) One Flew Over The Cuckoo's Nest.

4. The arrival of which two drugs turned the tide against psychosurgery?

(1) Haloperidol and Promazine
(2) Lithium and Chlorpromazine
(3) Imipramine and Thorazine
(4) Valium and Prozac

5. Which of the following conditions is Deep Brain Stimulation (DBS) not approved by the US FDA (Food & Drug Administration) for ?

(1) Parkinson's disease tremor
(2) Chronic Cluster headache
(3) Intractable Epilepsy
(4) Borderline Personality Disorder

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ARTICLE

The Triple Procedure: Analysis of Structural, Functional & Refractive Outcome

Radhika Natarajan* **Bharti Ahuja MS**

Medical Research Foundation, India

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ABSTRACT

To analyse the outcome of Triple procedure(Combined penetrating keratoplasty, cataract extraction and intraocular lens implantation) is a surgical technique for visually disabling corneal conditions with associated cataract. METHODS: The medical records of 120 patients who underwent triple procedure between January 2007 and December 2011 in terms of demographic data,past ophthalmic history, indications for surgery were retrospectively reviewed. Salient preoperative data included the initial visual acuity at the time of presentation, slit lamp findings of cornea(scar, haze, vascularisation, stromal folds with bullae), anterior chamber, lens details, intraocular pressure status, posterior segment examination with the help of indirect ophthalmoscope or B scan ultrasongraphy. RESULTS: A total of 120 corneal triple procedures performed were included in this study. Of 120 patients, 25 (20.83%) were male and 95 (79.17%) were female. Mean age of these patients was 42.45 +/-15.85 years (range 9 to 75 years). The mean postoperative follow up was 15.08+/-12.8 months (range,1.5 to 49 months). Failed therapeutic grafts (42.5%) - was the common indication found for surgery. Preoperatively, intraocular pressure was increased in 11 (9.16%) patients. Conventional triple procedure in terms of combined penetrating keratoplasty with extracapsular cataract extraction with intraocular lens implantation(PK+ECCE+IOL) was performed in 114 (95%) eyes, 01(0.83%) eye underwent keratoplasty with phacoemulsification with intraocular lens implantation(PK+PE+IOL), and secondary intraocular lens implantation (PK+IOL)in 05 (4.17%)eyes. CONCLUSION: Triple procedure is an effective surgical option in corneal diseases associated with cataract.It provides an optimal visual and refractive outcome especially in high risk grafts situation.

1. Introduction

Triple procedure(Combined penetrating keratoplasty, cataract extraction and intraocular lens implantation) is a surgical technique for visually disabling corneal conditions with associated cataract. First described by Katzin and Meltzer in 1966.It offers immediate postoperative visual improvement and precludes the need of another major intraocular surgery for cataract in future that may jeopardize the corneal graft. It is generally indicated in patients with significant cataracts and corneal diseases contributing to vision loss.

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In our study, we analysed the structural, functional and refractive outcomes of triple procedure in terms of graft clarity,postoperative refraction and visual rehabilitation.

2. Methods

The medical records of 120 patients who underwent triple procedure between January 2007 and December 2011 in terms of demographic data,past ophthalmic history, indications for surgery were retrospectively reviewed.Salient preoperative data included the initial visual acuity at the time of presentation, slit lamp findings of cornea (scar, haze, vascularisation, stromal folds with bullae), anterior chamber, lens details, intraocular pressure status, posterior segment examination with the help of indirect ophthalmoscope or B scan ultrasongraphy.Peribulbar block (2%xylocaine, 0.5%bupivacaine) was the most common technique of anaesthesia.Pupil was dilated preoperatively with 0.5% -1% tropicamide and 5% phenylephrine. Super pinkie was applied for a period of 5-10 minutes to have a soft eye prior to surgery after anaesthesia. Donor corneal rims preserved in MC Carey -Kaufman medium were used. Size of donor corneal button oversized the host corneal button by 0.5mm in all cases.Size of donor corneal button ranged between 6-9.5 mm.Most common trephine size was 8.0 mm followed by 7.5 mm. After the excision of host corneal button, anterior capsulotomy was done. The nucleus was delivered by bimanual technique.The rest of the procedure was same as cataract extraction by extracapsular technique.For intraocular lens power calculation, preoperative standard keratometry readings were used as K1= 44.00D @180 and K2=44.00D@ 90 respectively.The axial length for each eye was determined preoperatively and Intraocular lens power calculation was done using Sanders-Retzlaff-Kraaff II formula, SRK-T formula in cases of high (>24mm) and low axial lengths (<20mm). As the intraocular lens was placed in the posterior chamber or in the sulcus, suturing of donor cornea was done with 16 interrupted sutures of 10 -0 nylon monofilament or with a combined 8 interrupted and single continuous 10-0 monofilament nylon suture in some cases.Postoperative medication regime included as topical steroids, topical antibiotics,lubricants,systemic steroids and anti glaucoma medications to all patients as applicable.Any additional procedure done during surgery,intraoperative, early and late postoperative complications were noted.Patients have been followed up in initial 2-3 weeks, 6 weeks (glass appointment), 3-6 months and then at 1 year.Suture removal depended upon the looseness of sutures and the amount of astigmatism.The final outcome was assessed in terms of graft clarity, final visual acuity, refraction at the last available visit.Clarity/Successful graft taken as clear grafts with compact stroma and sharpely visible anterior segment details.

3. Results

A total of 120 corneal triple procedures performed were included in this study. Of 120 patients, 25 (20.83%) were male and 95 (79.17%) were female.Mean age of these patients was 42.45 +/-15.85 years (range 9 to 75 years). The mean postoperative follow up was 15.08+/-12.8 months(range, 1.5 to 49 months). Failed therapeutic grafts (42.5%) - was the common indication found for surgery. Preoperatively, intraocular pressure was increased in 11 (9.16%) patients. Conventional triple procedure in terms of combined penetrating keratoplasty with extracapsular cataract extraction with intraocular lens implantation(P-K+ECCE+IOL) was performed in 114 (95%) eyes, 01(0.83%) eye underwent keratoplasty with phacoemulsification with intraocular lens implantation (PK+PE+IOL), and secondary intraocular lens implantation (PK+IOL) in 05 (4.17%) eyes.

Various indications for procedure were listed as follows:

Table 1. Indications for Triple Procedure

S.no.	Indications	Frequency(n=120)
1	Regrafts	51 (42.5%)
2	Corneal scars	34 (28.33%)
3	Adherent leukomas	26 (21.67%)
4	Others	09 (7.5%)

Others include:

S.no.		(n=9)
1	Fuchs dystrophy	05 (55.5%)
2	Keratoconus	01 (11.11%)
3	Chemical injury	02 (22.22%)
4	Buphthalmos	01 (11.11%)

Table 2. Type of Triple Procedure

S.no.	Type of surgery	Frequency(n=120)
1	PK +ECCE +IOL	114 (95%)
2	PK+PE+IOL	01 (0.83%)
3	PK+ IOL	05 (4.17%)

3.1 Visual and Anatomical Outcome

76 out of 120 (63.33 %)grafts were clear and 44 out of 120 (36.67%) grafts were failed. Out of which 12 eyes developed graft infection, 10 eyes had uncontrolled rise in intraocular pressure, 21 eyes had immunological rejection, 01 was primary graft failure. The initial (preoperative) visual acuity was perception of light /upto counting fingers 1 meter in maximum cases(99.16%), in 01 eye(indication -keratoconus) only preoperative visual acuity was 6/36

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(logmar-0.778). Postoperative visual acuity in terms of Snellens chart noted as below.

Table 3. Visual acuity at last follow up

S.no.	Visual acuity	No.of eyes/patients
1	<1/60	42(34.2%)
2	1/60 to 5/60 (logmar=1.778to1.07)	11(9.2%)
3	6/60to 6/18 (logmar =1 to 0.477)	46(38.33%)
4	6/12 to 6/6 (logmar=0.30to 0)	21(18.33%)

Definite cause of decreased vision was noted in 10 patients, all these were clear grafts. 06 eyes were damaged due to glaucomatous optic atrophy, 02 eyes were amblyopic,01 clear graft with scarred Choroidal neovascular membrane and 01 was a primary graft failure. Combined penetrating keratoplasty and cataract extraction was performed in 7(5.833%) eyes of monocular patients with a potential for visual recovery.The BCVA in these cases at presentation was CF 1 meter. Postoperatively, 06 patients had clear crafts with improvement in vision, 01 graft failed due to glaucomatous damage.

Table 4. Profile of failed grafts at last followup

S.no.	Primary indication for failed grafts	Frequency(n=44)
1	Regrafts	26(59%)
2	Adherent leucoma	06(13.6%)
3	Corneal scars	07(15.9%)
4	Others	05(11.36%)

Others include: buphthalmos=01, trauma=01, trachoma=01, fuchs dystrophy=01, chemical injury=01 Corneal scars=07 (viral=04)

Table 5. Causes of graft failure

S.no.	Causes	Frequency (n=44)
1	Graft infection	12(27.27%)
2	Rise in intraocular pressure	10(22.73%)
3	Immunological graft rejection	21(47.72%)
4	Primary graft failure	01(2.27%)

3.2 Refractive Details

Refractive details(in form of manifest refraction) were available in 73 patients. All post-operative refractions were transposed to negative cylinders for analysis. Mean spherical equivalent at available followup was 0.229+/-2.48D. 41% of all eyes had postop refractive errors (spherical equivalents)within +/-2.0D of emmetropia. Postoperative refraction was targeted towards emmetropia in 61.12%, and towards -1.0 D myopia in 38.94% cases. Mean keratometric cylinder was available for only 30 patients so extrapolation of data was not possible.

Table 6. Parameters

S.no.	Parameters	
1	Mean axial length	23.64+/-1.85mm
2	Mean intraocular lens power implanted	19.95 +/-4.71D
3	Mean spherical equivalent	0.229+/-2.48D
4	Mean refractive cylinder	-4.21+/-2.39D
5	Range of spherical equivalent	-6.50 to +6.0D
6	Range of refractive cylinder	-1.0D to -16.00D

3.3 Complications

Vitreous upthrust was seen in 05 (4.16%) eyes during surgery for which anterior vitrectomy was done. The common early postoperative complications included increased intraocular pressure in 22 (18.33%) eyes, increased AC reaction in 63 (52.5%) and wound leak in 03 (2.5%), managed with appropriate measures. Other complications noted as posterior capsular opacification in 18(15%) cases,managed well with Nd: YAG capsulotomy and persistent epithelial defect in 05 (4.16%) eyes,out of which 04 (80%) grafts failed due to secondary infection, 01 (20%) survived.

4. Discussion

Fuchs dystrophy was the most common indication for triple procedure in 31.3-77% [2] of patients.Corneal scarring (including adherent leukoma)-66.4%with associated cataract was the most common indication in other study [1]. In our study, therapeutic failed grafts (42.5%), followed by corneal scarring associated with cataract was found to be the most common indication(28.33%). The proportion of corneal scars is very less in our study and found to be statistically significant (Z test for proportion, p - value < 0.001)

Taylor [11] et al. reported 77%clear grafts and 57%with visual acuity 20/40 or better; Lee [12] and Dohlman reported 73%clear grafts and visual acuity 20/50 or better in 47%of their patients. Various other series have reported a graft clarity of 90-100% [4-6].Sridhar etal found 72%grafts clear after a mean follow up of 23.7+/-17.6 months [1]. As compared to other reports, graft clarity rate was found to be 63.33% with a visual acuity of 20/40 or better in 18.33% eyes in our study at a mean follow of 15.08+/-12.8 months(range=1.5 to 49 months),probably because we encountered more of failed grafts (after infectious keratitis) as a major indication, which are in themselves high risk grafts and in which the surgical success is in any way is less compared to other indications.

Postoperative glaucoma as a major complication seen in 24% eyes in a series of 104 eyes,and endothelial rejection in 16.2% by Meyer etal (14); Sridhar etal reported secondary glaucoma in 13.5%, graft infiltrate in 5.8%, 18.3% secondary graft failures. In our study we had

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Graft rejection as a major cause for secondary graft failure(47.72%), secondary glaucoma in 22.73%, graft infection in 27.27%.

Various Studies have shown that Intra ocular Lens power calculation with regression formulas in cataract surgery results in postoperative refractive errors within 2 diopters (D) of emmetropia in more than 90% of cases [8,9]. In contrast, when a cataract and corneal opacity coexist, regression formulas are not as accurate because the ultimate corneal curvature is less predictable [10].

Binder etal analysed in a study of 43 consecutive triple procedures, a mean refractive error of 1.79Dand 70% of eyes achieved 20/40 or better corrected visual acuity, 48.8% achieved refractive errors within 2 diopters of emmetropia [6].

41% of our patients had refractive errors within +/-2.0 diopters of emmetropia, with 18.33% eyes achieved visual acuity of 20/40 or better with a mean spherical equivalent of 0.229+/-2.48D with a range of refractive error between -6.50 to 6.0D.Sridhar(1) etal studied 58.8%eyes within +/-2D of predicted refraction in 104 patients. Shimmura etal (15) studied 26-68% final refraction within +/-2.0D of target, with the range of refractive error between -14.7 to +8.0D.

Table 7. Previous studies related to triple procedure for comparison

S.no.	Study	Design	No. Of eyes	Mean follow up(months)	Eyes +/-2.0Dof target/ emmetropia(%)	MSE (D)	Mean cylinder	BCVA./=6/12(%)	Graft survival (%)
1	Nguyen etal	Retro	499	12	47	1.20	4.16	61	97
2	Gruenauer etal	Retros	53	20.5	47	-2.06	-4.00		100
3	Pinneros etal	retro	93		42		3.90	65	
4	Present study	retro	120	15.08	41	0.229	-4.212	18.33	63.33
	P value			<0.001	0.0169	<0.001	0.334	<0.0001	<0.0001

Note:
One proportion Z test →Eyes +/-2.0Dof target/emmetropia, BCVA./=6/12 and Graft survival; One sample Z test →Mean follow up(months), MSE(D) and Mean cylinder

5. Conclusion

Triple procedure is an effective surgical option in corneal diseases associated with cataract.It provides an optimal visual and refractive outcome especially in high risk grafts situation.

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REVIEW

Aging and Geriatric Dentistry

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ABSTRACT

Five theories shed lights on the potential mechanisms of aging: somatic mutations, telomere loss, mitochondrial defects, and accumulation of altered proteins inside proteasomes. The existence of a program of aging is not yet identified, but overlaps with a program for risks of death. On the other hand, organisms are programmed for survival, which ultimately fails. This failure results in aging, notabily, focusing on alterations of specific genes. Irregular examinations, dysfunctions, insufficient use of fluoride, and removable partial dentures, are favoring the formation of caries and periodontal pathologies. Oral lesions are due to local trauma, related gingival recession, and formation of pockets. They are associated to insufficient removal of food/plaque. Epithelial thinning, and reduction of extracellular matrix components, lead to plications and foldings of the mucosal surface, and subsequently to bacterial colonization. Geriatric dentistry (or gerodontology) is an increasing field of dentistry, mostly associated with the growing percentage of patients over 80+ years.

1. What is Aging: a Summary of Aging Theories

Aging is characterized by deteriorations, increasing risks of death. Geriatric dentistry includes the diagnosis, prevention of caries and periodontal diseases and treatment, oral mucosal pathologies, alveolar bone resorption, development of malignant tumors, and salivary dysfunctions.

Theories aiming to clarify the aging phenomenon include :

(1) the Somatic Mutation Theory, establishing a relationship between longevity and DNA repair.

(2) The Telomere Loss Theory, the telomers becoming shorter after each cell division.

(3) The Mitochondrial Theory implicating accumulation of mitochondrial DNA.

(4) Altered Proteins Theory and waste accumulation, focusing on proteasomes.

(5) Network Theories of aging : The multiplicity and complexity of aging mechanisms is now recognized [1].

The conclusions on the existence of a program of aging are far from being elucidated, facing the increased risks of death. Inversely, it is clear that organisms are programmed for survival. However, this program ultimately fails, and this disfunction clarify the mechanisms of aging [1]. Genes involved in autophagy have provided some insights into senescence and death [3].

With aging, a progressive decline is marked in multiple cells and tissues [4]. After a limited number of cell

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divisions cultured human cells stop dividing according to replicative senescence. The loss of telomere repeats contributes to human aging. Mutations of telomeres lead to progressive failures. Telomere length is acting as a trait that is sufficient to mediate the degenerative defects of aging [2].

Deleterious free radical are also implicated are major contributor to the aging process [5]. Search for a single gene has been replaced by the view that aging is a complex, multifactorial process [6]. Evolutionary, molecular, cellular, and systemic theories have been postulated.

1.1 The Programmed Theories

There are five characteristics of aging in mammal tissues [7]: (1) Increased mortality with age. (2) Changes in biochemical composition in tissues. Increased lipofuscin and cross-linking in ECM. (3) Progressive decrease in physiological capacity. (4) Reduced ability to respond to environmental stimuli, and (5) Increased susceptibility and vulnerability to disease.

Alltogether they implies three sub-categories [8].

(1) Programmed Longevity. Aging result of a sequential switching of genes,

(2) Endocrine Theory. Biological clocks act through hormones and control aging.

(3) Immunological Theory. The immune system is declining. This leads to an increased vulnerability.

Two biomarkers of aging accumulate : lipofuscin and an increased cross-linking in extra-cellular matrix molecules. Pigment is formed by oxidative polymerization of mitochondrial lipids. Large deposits of melanin produced by free radical reactions are associated with detrimental changes. The free radical theory of aging (FRTA), and simultaneously discovery of the involvement of free radicals are producing changes together with a decrease in biological capacities, The susceptibility and vulnerability to diseases is increased. The ALE (average life expectancy) is reaching plateau values, less than the maximum of elderly above 85 years.

1.2 Causes and Theories of Aging

The concepts behind the stochastic theorie are the build-up of ‘‘damages’’, whereas the genetic theories consider aging as part of the lifespan. The genetic and stochastic theories are not mutually exclusive. Damaged proteins are broken down by proteases, however, when proteases are inhibited, damaged proteins accumulate.

Several investigators have suggested the essentiality of various membranes in maintaining intracellular homeostasis and deterioration of membrane integrity. This is the underlying cause of the aging process: (1) vesicle-dependent lysosomal pathway and (2) the ubiquitin/proteasome pathway. The proteasome is a non-lysosomal threonine type protease. Ubiquitin is crucial for the degradation of many cytosolic, nuclear and endoplasmic reticulum proteins.

Aged cells stored damaged or altered proteins when compared to young cells. One of the hypothesis is the decrease with age of proteasome activity. Accumulation of altered proteins explain the increased protein alterations, and the decreased protein degradation or the combination of both.. Age-related alterations in lysosomes regulate the accumulation of lipofuscin.

1.3 Autophagy

Autophagosomes characterize autophagy. Subsequently merging with lysosomes they form an autophagolysosome where degradation occurs and used for the renewal of synthesis of molecules. The vesicles fuse with secondary lysosomes, and are enriched by proteases Two enzymes modulate the formation of the autophagic compartments.

1.4 Causes of Cellular Senescence

Normal human cells did not proliferate indefinitely in culture. These cells have a finite replicative life span, and undergo replicative senescence. The number of divisions that cells complete upon reaching the end of their replicative life span has been termed the Hayflick limit.

Many senescent cells display a senescence-associated secretory phenotype (SASP), which may explain the role of cellular senescence in the aging process.. These factors include IL-6 and IL-8, a variety of MCPs (monocyte chemoattractant proteins), MIPs (macrophage inflammatory proteins), and proteins regulating granulocyte/macrophage colony–stimulating factor.

Macromolecules such as nucleic acids, lipids, sugars, and proteins are susceptible to free radical attack. The body does possess some natural antioxidants in the form of enzymes, which help to curb the build-up of these free radicals. Cellular death rates would be greatly increased without these enzymes. Subsequently if this was the case, life expectancies would decrease.

2. Aging and Oral Health

In 1900, 3.1 million people, or 4 percent of the population, were 65 years or older. By 2005, the number had increased to 34.3 million people, or 12.4 percent of the population. For older than 65 years, the percentage is going from 16% in 2000, to 25% in 2030 and 29% in 2050. Effects of aging on oral hard and soft tissues are summa-

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rized in this second part [9].

The elderly are at risk of chronic diseases, including infections, benign mucosal lesions and oral cancer. Frequent conditions are xerostomia (sensation of dry mouth) and oral candidiasis, appearing as acute pseudo-membranous,, and/or angular cheilitis.. Many systemic conditions, are typical in the elderly. Socio-economic factors (traveling costs, educational background) interfere with the maintenance of a functioning dentition and a healthy oral cavity. The aging population is growing and older adults have more teeth and oral problems than did previous cohorts.

2.1 Diseases of Oral Tissues

Dental tissues : severe enamel wear exposes dentin. Cementum gradually thickens. Pulpal calcification and external root resorptions contribute to a decreased pulp volume.

Elderly patients are more susceptible to root caries due to inadequate oral hygiene, salivary gland dysfunction, insufficient use of fluoride and removable partial dentures, traping plaque around the teeth, local trauma, exposure of cementum/dentin at the cervical junction, periodontal pockets, and insufficient removal of food/plaque between the teeth contributes to the onset of oral pathologies. Endodontic considerations in the elderly reduce the potential infection, namely in narrow root canals, that are difficult to find, enlarge and fill.

Periodontal tissues diseases are initiated by gingivitis, becoming periodontitis. Atrophic Bone Loss reduces mostly alveolar bone, basal bone being unaffected.

2.2 Oral and Pharyngeal Mucosa

Ageing affects oral tissues and pathologies that are integral components of general health. Oral diseases cause difficulties in speaking, mastication, swallowing, in addition to aesthetical considerations and facial alterations. Strategies should be adopted including the management of oral conditions, which are necessary for re-establishing effective masticatory function. Oral health is affecting the quality of life.

With elders, tongue dorsum shows reddening, and atrophy of the papillae. Tongue may be completely smooth or lobulated. These changes bring about an altered taste and decreased appetite. Increased varicosities at the ventral surface are common.

A lifelong history of oral mucosal trauma, can modify the clinical aspect. Covered by keratinocytes, other types of cells are also found, including Langerhans cells (LC), lymphocytes and Merkel cells. Alterations in the distribution of macrophages in gene trascription pattern was significantly increased. Histologically, epithelial thinning, increased fibrotic connective tissues, reduction of LC density have been reported. They are displaying long and branched cytoplasmic processes. In older patients, the LC network is deteriorated and the reduction of this network is age-related.

Leukoplakia is associated with an increased risk of cancer. Most of the oral carcinomas are squamous carcinomas in the lower lip, tongue, gingivae and floor of the mouth. Potential malignant lesions: Tobacco and alcohol use are responsible for up to 75% of oral cancers. The human papillomavirus, influence the immunosuppression, and is implicated in this types of cancer. With aging, epithelium becomes thinner, with a reduced elasticity. Gingival recession occurs, with a parallel decrease of cells producing collagen fibers, vascularization and simultaneously a decrease in alveolar bone density.

2.3 Aging Salivary Glands (xerostomia)

This involves degenerative alterations, sialadenitis, sialolithiasis, and hypofunction. Xerostomia is associated with complaints of dry mouth and hyposialia. The prevalence of hyposalivation in older people may be explained by the increased incidence of medication, such as diuretics or daily aspirin.

The volume of the connective tissue and intralobular ducts is increased, whereas acinar cells are decreasing. Saliva becomes thicker. Medications like anti-hypertensives, anti-psychotics, and anxiolytics lead to xerostomia,. The absence of protective influence of saliva in the oral cavity intensify the predisposition to oral disease. Financial constraints and lack of family transportation making easier the access to dental services. The burning mouth syndrome (BMS): Several conditions lead to ‘secondary’ BMS: allergic reactions, galvanism, parafunctional habits, and salivary gland dysfunctions. Moreover, hormonal disorders correlate to menopause, diabetes and nutritional deficiencies. Systemic conditions influence the prevalence, onset, and severity of BMS..

3. Conclusions

Elderly people lose manual dexterity, and they are likely to have poor oral hygiene. Elderly people receives medical treatments that result in the consumption of approximately 25% of the national total of the drugs prescripted. Medications cause a reduction in salivary flow as a side effect. Elderly people are deficient in salivary flow, combined with diminished oral hygiene practices. This lead to plaque accumulation on the tooth and denture surfaces, therefore to caries, periodontal diseases and prosthetic

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problems [10].

The phenomenon of aging is not yet elucidated, but the consequences of aging are better identified, leading to adapted gerodontological therapies. Caries and periodontal diseases, infection due to bacterial invasion, early stages of cancer and related tumors, radiotherapy inducing xerostomiae, burning mouth syndrome, are the fundamental targets of gerodontology. This is an increasing field of dental practice, mostly associated with the growing group of patients over 80+ years.

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ARTICLE

Subjective Well-Being among Empty-Nest Elderly and Its Related Factors: Taking Guangdong Province as an Example

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Multiple variable linear regression

ABSTRACT

Objective: To explore the the status of happiness and social support of empty nesters in Guangdong Province and analyze the relationship between the above two variables. **Method:** Totally 1148 empty nesters (776 males, 734 females) from 5 cities in Guangdong province are selected by stratified random sampling and conducted with Memorial University of Newfoundland Scale of Happiness (MUNSH), Social Support Rating Scale (SSRS), Mini-Mental State Examination (MMSE) and a self-edited questionnaire on the general information. **Results:** The total score of MUNSH is (10.20±6.37). The total score and the scores of the 3 dimensions of objective support, subject support, the use of support in SSRS are (30.79±5.51), (9.24±2.37), (19.38±4.95) and (9.22±2.15) respectively. Multiple variable linear regression show that are positively associated with the total scores of MUNSH (B= .227, .115, .098, .158, .082, respectively, P< .05). was negatively associated with total score of MUNSH (B=–.097, P< .05). **Conclusion:** It suggests that the sort of leisure, gender, progress rank, family characteristics, such as family economic condition and father's career may be related factors of undergraduates life satisfaction.

1. Introduction

In the 21st century, the aging of population has become a global problem and it is becoming more serious in China. According to the *Statistical Bulletin of China's National Economic and Social Development 2018,* the population aged 60 and above has reached 248 million and the population aged 65 and above has reached 167 million (accounting for 11.9% of total population) with 17.17% aging level[1]. The mental health of the elderly has also attracted increasing attention from all sectors of society [2-3].

Subjective Well-Being (SWB) can be defined from many perspectives. Most researchers agree with the concept proposed by Diener (1984), believing that Subjective Well-Being is an individual's overall assessment of his/her life quality on the basis of self-determined standards, which consists of the following three aspects: (1) Cognitive assessment of his/her life quality (life satisfaction); (2) Positive emotions, including such emotional experiences as pleasure, happiness, a sense of meaning in life and energy; (3) Negative emotions, including anxiety,

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depression, sadness, loneliness, boredom, uncomfortable and other emotional experiences, but without emotional disorders and neurosis.

It shows that Subjective Well-Being is characterized by three basic features: (1) Subjectivity: Subjective Well-Being is mainly assessed by self-set standards rather than external standards, so it is mostly assessed by subjective reporting method; (2) Integrity: It reflects subjective life quality of the individual as a whole; (3) Relative stability: Subjective Well-Being does not change significantly with time or general changes in the environment [3].

There are many kinds of losses in the lives of old people: physiological loss, attractiveness loss, loss of family and social status, financial independence loss, loss of interpersonal relationships, loss of intelligence and vivid emotions. All kinds of losses tend to generate negative emotional emotions such as loneliness, depression, anxiety and dissatisfaction [15-16,21-24], leading to dissatisfaction with life, which can reduce the Subjective Well-Being of the elderly [4-7].

Individuals through social exchanges or social interaction can receive social support of all kinds of help from others, including passively received help and actively seeking help [2]. Social support is an independent factor which affects the Subjective Well-Being of the elderly [22].

"Empty-nest" elderly generally refer to those aged 65 or above with children and grandchildren who are not around or living locally [1]. With the aggravation of the aging of the society, urbanization acceleration and life pressure aggravation of young people, the number of "empty nest" old people is increasing year by year. What is the status of social support and Subjective Well-Being for "empty nesters"? How does social support influence the Subjective Well-Being of "empty nesters"? What other factors affect the Subjective Well-Being of empty nesters? This article aims to answer the above questions.

2. Objects and Methods

2.1 Objects

2.1.1 Sample Size Estimation

G* Power 3 is used to calculate the minimum sample size [8]. As depression is a common psychological disorder among the elderly, it plays an important role in predicting the Subjective Well-Being of the elderly. The prevalence rate of depression among the elderly is adopted to calculate the sample size. Previous studies have shown that the incidence of depression among the elderly in China is 6.50 ~ 63.50%[3,9-10]. Its test effect value is a medium, which means d value is 0.50 ~ 0.80 [11]. In this study, with the effect value d = 0.70, the statistical test force 1-β=0.80, class error probability α= 0.05, the minimum sample size needed by the survey is 786. The minimum sample size is determined to be 943 with 20% chance of follow-up loss.

2.1.2 Sampling

A total of 1,300 elderly people were selected from Shenzhen, Dongguan, Zhuhai, Shanwei and Heyuan from March 2019 to April 2019 through stratified random sampling. Inclusion criteria: over 60 years old, mentally and intellectually normal, hospitalized elderly in nursing home for more than half a year. Exclusion criteria: Alzheimer's disease, severe physical disease, mental disorder and other reasons without capacity to complete scale accessing. We actually met 1258 people with visiting rate of 96.8%. Excluding mental disorders, with the screening by MMSE, fifteen (7.7%) of the subjects were positive and 41 (3.2%) were difficult to answer questions due to severe hearing and visual impairment, as well as 54 (4.2%) subjects said they were unwell and unwilling to cooperate with investigators. A total of 1,148 subjects complete various surveys with an effective rate of 88.3%. Among them, 307 in Dongguan, 342 in Shenzhen, 178 in Zhuhai, 164 in Shanwei and 157 in Heyuan; 628 (295 males and 333 females) are hospitalized in nursing homes, 348 (166 males and 182 females) are living alone and 172 (86 males and 86 females) are living with their husband or wife. The average age is (73.6±7.2) years old, among which 644 are 60 ~ 70 years old, 352 are 70 ~ 80 years old, and 152 are 80 ~ 90 years old. And 288 are unmarried, 576 are widowed and 284 are married with spouses alive. As for the average years of education (9.51±3.78); 412 illiterates, 337 primary school graduates, 239 junior middle school graduates, 137 senior high school or technical secondary school graduates and 23 junior college or undergraduate students; 453 in urban areas and 695 in rural areas; There are 456 pensioners, 418 savers, 174 children providers, 46 depending on other family members, 24 people on subsistence allowances and 30 people on commercial insurance.

2.2 Tools

2.2.1 Memorial University of Newfoundland Scale of Happiness, MUNSH [12]

It's compiled by Kozma (1980) to assess the Subjective Well-Being of the elderly. It consists of 24 items. Among them, 10 items reflect positive emotion (PA) and negative emotion (NA), which 5 items reflect PA and NA respectively. Another 14 items reflect positive experiences (PE) and negative experiences (NE) with 7 items each reflecting PE and NE. Total happiness =PA-NA+PE-NE, score

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range -24 to +24. For ease of calculation, the constant 24 can be added and score ranges from 0 to 48. The higher the score, the higher the happiness.

2.2.2 Social Support Rating Scale, SSRS [13]

The social support rating scale is complied by Xiao Shuiyuan (1987) which aims to assess social support and its use. There are 10 items, which are divided into three dimensions: objective support (actual support received), subjective support (experienced or emotional support) and utilization of support (active use of various social support, including ways of talking, asking for help and participation in activities). The higher the score, the higher the level of social support. In general, if the total score is less than 20, it refers to less social support; 20 to 30 scores refer to general social support; More than 30 scores refer to satisfactory social support. In this study, the Cronbach' a coefficient of the scale is 0.903 and the Cronbach' a coefficient of each dimension is between 0.834 and 0.875.

2.2.3 Mini-Mental State Examination, MMSE [14]

It is also known as Mini-Mental State Checklist. The Mini-Mental State Examination is compiled by Folstein (1975) and revised by Zhang Mingyuan (2003), which is mainly used for the measurement of orientation, memory, language, calculation and attention. There are five items, including time and place orientation, language(retelling, naming, understanding instructions), mental arithmetic, immediate and short-term auditory word memory as well as visual structure imitation. The highest score is 30 and the cutoff value is ≤17 in the illiterate group, ≤20 in the primary school group and ≤24 in the secondary school group. Scores below the cut-off point are associated with cognitive impairment. The reliability and validity, specificity and sensitivity of the scale are high. In this study, the Cronbach' a coefficient of the scale is 0.813.

2.2.4 Self-compiled Questionnaire for General Information and Living Conditions of Elderly Individuals

This questionnaire consists of gender, age, living mode, marital condition, way of old-age care, educational level, occupation before retirement, economic income, with or without children, entertainment, consumption, etc.

2.3 Collection and Collation of Materials

The researchers involved in the survey were given unified training and survey process and rating standards of the scale were also unified. The consistency test (Kappa=0.81~0.90) was conducted to meet the requirements of psychological measurement.

Through the checking way of meeting at home, questionnaires were gave out by investigators and the elderly were invited to fill in by themselves. For those who cannot complete the questionnaire alone due to illiteracy or other reasons, investigators would read out the questions in a uniform way and make objective records according to answers.

The questionnaires with complete absence or absence rate≥50% of all dimensions were eliminated directly and valid questionnaires were estimated and filled. Epidata3.0 software was used for data entry and two researchers independently entered the same data for unified logic check so as to ensure the accuracy of the data.

2.4 Statistical Approach

Data which were exported from Epidata3.0 to SPSS 20.0 software should be made statistical analysis. The main statistical methods include descriptive statistics, independent sample *t* test, x^2 test, Pearson correlation analysis and multiple linear regression analysis.

2.5 Ethical Approval

The procedure and contents of this study conform to the ethical standards set by the Ethics Committee of Chinese Medical Association with approval of this committee.

3. Result

3.1 Descriptive Statistics

The total well-being scores of this group are (39.83±6.04) and the total SSRS scores are (31.15±7.29). It indicates that the Subjective Well-Being of the elderly in this group is relatively high and they get relatively satisfactory social support as shown in Table 1.

Table 1. The descriptive statistics of MUNSH and SSRS score

Part	X±s	Min	Max
Total happiness degree	39.83±6.04	12.00	62.00
PA	7.08±1.76	2	10.00
NA	87±1.93	0	10.00
PE	10.20±2.43	0	29.00
NE	57±1.28	0	8.00
Total SSRS score	31.15±7.29	14.00	49.00
Objective support	8.25±2.49	3.00	15.00
Subjective support	15.70±3.18	7.00	22.00
Support use degree	7.20±2.79	3.00	12.00

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3.2 Single Factor Analysis of Total MUNSH Scores' Influencing Factors

According to single factor analysis, 34 items have statistically significant effects on MUNSH total scores, such as living mode (df=3, F =-33.476, P =.000), gender (t= -3.414, P =.001), education level (df =4, F =-36.465, P <.001), marital status (df=2, F =-35.880, P <.001), health status (df =3, F =-173.360, P <.001), self-care condition (df =4, F =-12.194, P <.001), suffering from several chronic diseases (df=4, F = 3.369, P =.009), with or without children (t =-7.530, P <.001), relationship with children (df =3, F=-20.431, P<.001), the frequency of children visiting (df =3, F =-23.255, P<.001), self-rated degree of loneliness (df =4, F=32.831, P<.001), liking mahjong and poker or not (t=-6.234, P<.001), having chess hobby or not (t =-3.735, P<.001), liking physical exercise or not (t= -4.802, P<.001), whether they like TV, newspapers or radio (t=-4.729, P<.001), whether they like to sit around and chat (t=-3.024, P =.003), whether they have pets (t= -5.955, P<.001), whether there is a housing problem (t =3.744, P <.001), whether they are concerned about medical costs (t=3.586, P <.001), whether they are worried about their children visiting less (t=3.717, P<.001), whether they are worried about loneliness (t =4.335, P<.001), whether there is nothing to worry about (t= -3.615, P< .001). favorite pension method (df =3, F =9.251, P < .001), whether legal aid is required for day care services (t=4.732, P<.001), need for room service (t=2.042, P=.041), need for escorted medical service (t= 3.202, P=.002), degree of objective support (r =.458, P<.001), subjective support (r=.377, P<.001), support utilization (r =.399, P< .001), total score of social support (r =.481, P< .001), sleep quality (df =3, F =-15.870, P< .001), main economic sources (df =5, F=17.215, P =.004), pension level (df =-5, F= -33.034, P<.001), monthly income level (df =5, F= -4.214, P=.016).

And 15 items have no statistic meaning on total MUNSH scores, such as origin (df =4, F=1.035, P=.278), age stage (df =2, F=2.374, P=.094), medical convenience (df =3, F=-1.874, P=.132), whether enjoy subsistence allowance (t=1.461, P=.062), occupation before retirement (df=4, F=1.726, P =.178), monthly consumption amount (df =3, F=-1.256, P=.237), whether like to do housework (t=-1.350, P =.177), whether they want to get home medical service (t=-.049, P=.961),whether they are worried that no one will take care of them in life (t=1.078, P=.281), whether they need domestic help (t=1.503, P=.134), whether they need telephone hotline service (t =.464, P=.643), whether they want others to do shopping for them (t=.994, P=.322), whether a shower escort is required (t=.310, P =.757), whether a day care service is required for the elderly (t=.298, P=.766) and whether life service is required (t=.101, P=-.920).

3.3 Regression Analysis

3.3.1 Variable Assignments

The possible conditions (alternative answers) of 35 variables (demographic variables and psycho-social variables) with significant influence on MUNSH score in uni-variate analysis were assigned, and the results were shown in Table 2.

Table 2. Variable assignments

Project	options and assignments
1.gender	0=female, 1=male
2.educational level	0=illiteracy, 1=primary school or below, 2=junior school, 3=senior high school and technical secondary school, 4=junior college or college
3.whether have children or not	0=no, 1=yes
4.relationship with children	0=without children, 1=many conflicts, 2=common relationship, 3=good relationship
5.the frequency of children visiting	0=without children,1=little, 2=sometimes, 3=often
6.marital status	0=bereft of one's spouse; 1=unmarried; 2=married with spouse alive
7.living mode	0=living alone,1=in a nursing home,2=living with children, 3=living with spouse
8.self-care condition	0=by nursing home, 1=by nurse , 2=by children, 3=by spouse, 4=on their own
9.health condition	0=very bad, 1=not good, 2=common, 3=very good
10.with a few chronic diseases	0=no 有 , 1=one, 2=two kinds, 3=three kinds, 4=four kinds or above
11.sleep quality	0=so bad, 1=not good, 2=common, 3=very good
12.main economic source	0=pension,1=saving,2=from children,3=from other family members,4=subsistence allowance,5=commercial assurance
13.pension level	0=less than 1000 RMB, 1= 1001~1500RMB, 2=1501~2000RMB, 3=2001~2500RMB, 4=2501~3000 RMB, 5=3001RMB or above
14.monthly income level	0=less than 1000 RMB, 1=001~1500RMB, 2=1501~2000RMB, 3=2001~2500RMB, 4=2501~3000RMB, 5=3001RMB or above
15.self-rated loneliness degree	0=never, 1=occasional, 2=sometimes,3=often, 4=always
16.Whether like playing mahjong or poker	0=no,1=yes
17.whether like chess activities	0=no,1=yes
18.whether like sports excise	0=no,1=yes
19.whether like reading newspapers and listening to radios	0=no,1=yes
20.whether like sit around and chat	0=no,1=yes
21.whether keep pets	0=no,1=yes
22.whether have housing problems	0=no,1=yes
23.whether worry about medical charges	0=no,1=yes
24.whether worry about less children visiting	0=no,1=yes
25.whether worry about loneliness	0=no,1=yes
26.whether worry about nothing	0=no,1=yes
27.favorite way of old-age care	0=by children, 1=in a nursing home,2=in a community, 3=self-care
28.whether want day-care service	0=no, 1=yes
29.whether need food delivery service	0=no, 1=yes
30.whether need accompanying medical service	0=no, 1=yes

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3.3.2 Multiple Linear Regression Analysis of Influencing Factors of MUNSH Total Scores

Multiple linear regression analysis is conducted with MUNSH total scores as the dependent variable and 34 variables found by uni-variate analysis with statistically significant influence on UNSH total score as the independent variable. Results show (Table 3), some items are positively correlated with MUNSH total score (B=.114 ~.587, P=.000 ~.020) , like living mode, marital status, educational level, health status, frequency of children visiting, whether like to play old-type poker or mahjong, whether keep pets, pensions level, social support total score. Some items are negatively correlated with MUNSH scores (B =0.077 ~ -.521, P =.000 ~.476), such as self-rated loneliness degree, whether worry about medical expenses, housing problems, whether need to get the day-care or legal aid services.

Table 3. Multiple linear regression analysis of the main influencing factors of MUNSH total scores

Dependent variable independent variable	regression coefficient		Standardized regression coefficient	*t value*	*P value* R^2 *Radj*^{2}	
	β	SE				
MUNSH living mode	1.814	.307	.217	6.038	<.001 .594	.597
Total score marital status	2.521	.275	.316	8.575	<.001	
Education level	1.459	.204	.152	2.388	.027	
Health status	4.570	.327	.587	2.507	.020	
Pension class	3.919	.247	.513	4.692	<.001	
Frequency of children visiting						
Whether like playing poker	1.303	.243	.146	2.213	.034	
Whether like keeping pets	1.531	.216	.166	3.861	<.001	
Total score of social support	1.091	.239	.114	3.304	<.001	
	1.787	.267	.198	2.095	.036	
Self-rated loneliness level						
Whether worry about medical expenses	-3.469	.291	-.413	-6.374	<.001	
Whether have housing problems	-4.081	.256	-.521	-4.327	<.001	
Whether need day-care	-1.432	.400	-.130	-3.556	<.001	
Legal aid service	-.651	.238	-.077	-2.736	<.001	

4. Discussion

In this study, the total MUNSH scores are (39.83±6.04) and the total SSRS scores are (31.15±7.29), which is consistent with results in previous literature [15-17]. It suggests that the Subjective Well-Being of the elderly in this group is higher and they generally get more satisfactory social support. According to this study, some items are positively correlated with MUNSH total score, like living mode, marital status, educational level, health status, frequency of children visiting, whether like to play old-type mahjong or poker, whether keep pets, pensions level, social support total score, while some items are negatively correlated with MUNSH score, such as self-rated loneliness degree, whether worry about medical expenses, housing problems, whether need to get the day-care or legal aid services.

Health status is a positive predictor of subjective well-being in the elderly, which is consistent with the results of previous studies[15-18]. It suggests that physiological function plays an important role in mental health. Poor health conditions tend to make individuals feel uncomfortable and lost (including physiological and social functions).

As most of health problems of the elderly are the result of aging, they can only play a limited (sometimes even powerless) role in this, which may easily lead to depression, anxiety and other negative emotions [19-20], so as to reduce subjective well-being.

According to many literature, the participation degree of sports and entertainment can positively forecast the subjective well-being of the old[21-22]. However, through this research, only playing old-type mahjong and poker can positively forecast the subjective well-being of the old in many sports and entertainment activities. As for its reason, playing old-type mahjong and poker is the most suitable for physical and mental characteristics of the elderly. Due to reduced physical agility and intelligence, most elderly people (especially over 70) are not reasonable to regular exercise, such as running, playing ball games, dancing or normal leisure activities, such as karaoke, online games, travel. However, playing the old-type mahjong and poker can be economic, interesting, appropriate for men and women, without time constraint, easy to enhance friendship, which can make the elderly more pleasant with positive experience [23].

Previous literature has pointed out that income level can positively predict the subjective well-being of the elderly [15,16,24]. This study finds that monthly income has no significant predictive effect on the Subjective Well-Being of the elderly, while pension is a positive predictor, which is inconsistent with the above research results. It is sug-

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gested that the connotation and significance of monthly income and pension are different for the elderly. Monthly income includes not only pension (if the person is entitled to pension), but also money provided by children or relatives as well as social benefits. Therefore, monthly income is not stable. The pension is relatively stable, which is related to the working years and position level of the elderly before retirement. Relatively, stable pensions are more important for the elderly who are both less able to work and live independently.

The social support level of the elderly in this group is relatively high and it is positively correlated with overall well-being, which is consistent with the results of previous studies [16,25]. This is because the old are losing their physiological and social functions, which are increasingly dependent on outside support and help. Although the support of this group of empty-nest elderly from children is less than generally, to some extent, it complements the lack of children support, making "the old have something to depend on , something to support" because of old-age support of the government organs at all levels in recent years, many kinds of effective measures to help the elderly [26], as well as various forms of "support group" between the old at the same time [27]. Marital status and living mode are independent predictors of the overall Subjective Well-Being of the elderly and the happiness of widowed and single people is significantly lower than that of married and well-married couples, which is consistent with the results of previous studies [15,16,28]. Spouse is the most important source of social support for the elderly. And a good relationship between husband and wife can make the elderly calm and happy, so as to improve their happiness. The living mode reflects the positive correlation between the availability of important social support and subjective well-being. The availability of important social support and subjective well-being of the four categories of elderly -- living alone, living in nursing homes, living with children and living with spouse -- increased in turn. Because this group of objects is empty nesters, even if "living with children", they can not as often and timely get their children's care and help as those who live with their spouses.

The frequency of children's visits can positively predict the overall well-being of the elderly, which is consistent with the results of previous studies [29-32]. The frequency of children's visits actually reflects the extent of children's spiritual support to their parents [29]. Compared with the material support of their children, it is more able to bring old parents affectionate care, emotional comfort and personality respect, improve their self-esteem, self-confidence, optimism and other positive psychological experience, which is conducive to the improvement of subjective well-being [33].

The subjective well-being of the elderly with pets is significantly higher than that of the elderly without pets, which reflects the positive forecasting effect of social support on subjective well-being from another perspective. For empty nesters, pets are close and reliable friends as a special form of social support [34], which provide daily interactions, assistance in difficulties and emotional comfort for empty nesters.

The education level positively predicts the subjective well-being of the elderly, which is consistent with the results of previous studies [24,32]. Generally speaking, highly educated people have richer social experience and life contents, better comprehension ability and more flexible thinking. They are better able to regulate emotions, adapt to new environment and new life [32] who can find interests and absorb nutrients from life.

Loneliness can negatively predict subjective well-being, which is consistent with the results of previous studies [32]. Loneliness is a kind of social situation, which individuals can be aware of actual social relations worse than their expected situation with pain experience of isolation or lack of contact with others[35]. It reflects negative subjective experience of interpersonal alienation and even deficiency, social support deficiency [36], which may tend to increase incidence of disease and mortality, cause negative emotions, such as depression and suicidal thought[37], so as to severely lower subjective well-being.

Three items are negatively correlated with subjective well-being of empty nesters, which is consistent with the results of previous studies[15,16,32], including whether they worry about medical expenses, whether they have housing problems and whether they need legal aid for day care services. The three contents above reflect the subjective difficulties of empty nesters to some extent. The more difficult the subjective life is, the lower the subjective well-being of empty nesters will be.

5. Conclusion

The influence factors of subjective well-being of empty nesters are various. It can be divided into two categories: One is the influence of positive factors, which is mainly life resources of empty nesters, including material resources like pension, and spiritual resources, such as spouse's care, children support, good health, higher education level, liking playing old-type mahjong or poker, keeping pets, higher pensions class, higher degree of social support; The other is the positive influence factors, mainly subjective living difficulties of empty nesters, such as self-rated loneliness, worrying about medical expenses, housing problems and need for legal assistance of day

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