Review Article

Cystic dilatation of the ventriculus terminalis: A narrative review

ABSTRACT

Introduction: The terminal ventricle, also known as the fifth ventricle, is a tiny relic cavity in the conus medullaris of the human spinal cord. Our purpose in bringing attention to this condition is to get the word out about the signs and symptoms, diagnostic hurdles, and therapeutic options available for it.

Methods: All relevant studies involving patients diagnosed with ventriculus terminalis (VT) were retrieved from PubMed, Google Scholar, and Scopus. Studies published in complete English language reports were included. The terms VT, terminal ventricle, and 5th ventricle. Age, gender, presenting symptoms, magnetic resonance imaging findings, treatment, and outcome of patients with ventriculus terminalis were all included and recorded.

Results: The average age of the patients was 39 years, and there were 13 men among them (14.4%). Motor deficits and sciatica were the most commonly reported symptoms in 38 and 34 patients (42.2%, 37.7%), respectively. In 48 patients (53.3%), cyst fenestration was performed, and in 25 patients (27.7%), myelotomy was performed. Fifty-eight patients (64.4%) saw a reduction in cyst size after surgery. The majority of patients reported an improvement in their symptoms in 64 cases (51.1%), with only three cases (3.3%) reporting a worsening.

Conclusions: In cases where the VT is the source of symptoms such as motor, sensory, or bladder dysfunction, surgical intervention is recommended. This review compiles information from the available literature to shed light on the anatomy, clinical presentation, imaging, and treatment options for this variant. It also aims to pinpoint any potential drawbacks or restrictions connected to the surgical techniques.

Keywords: Fifth ventricle, terminal ventricle, ventriculus terminalis

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INTRODUCTION

The ventriculus terminalis (VT), also known as the fifth ventricle, is an enlargement of the central canal in the conus medullaris [Figure 1]. It is a common finding in scans of newborns and infants done with ultrasound and magnetic resonance imaging (MRI).[1] Most VT shrink before the age of 5 years and are thus considered transient structures.[2] However, it can persist and grow in some cases, putting pressure on nearby nerve roots and the spinal cord.[3] No one knows yet

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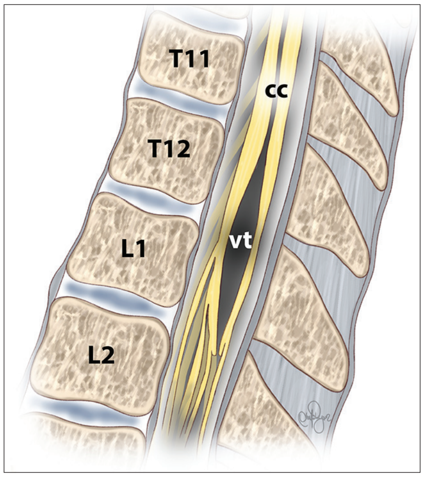

Figure 1: An illustrative picture of ventriculus terminalis (CS: Canalis Centralis, VT: Ventriculus Terminalis)

what role the VT plays physiologically. It has been hypothesized that the VT, the distal end of Reissner's fiber emanating from the epithalamus, functions as a mechanoreceptor sensitive to changes in cerebrospinal fluid pressure.[4]

Depending on the size and location of the cyst, VT can cause a wide range of different clinical presentations. Some individuals may not show any noticeable signs, while others may experience symptoms such as lower back pain, reduced strength or sensation in the legs, difficulties with walking or maintaining posture, loss of control over urine or feces, and poor sexual function.[5,6] MRI is the gold standard for diagnosing VT because it clearly displays the characteristic appearance of a hollow filled with fluid inside the conus medullaris. The differential diagnosis includes additional cystic lesions that might impact the spinal cord, such as syringomyelia, arachnoid cysts, or malignancies.[7]

The treatment of VT depends on the severity of symptoms and the likelihood of neurological deterioration. Surgical intervention may be beneficial for some patients, while routine monitoring and noninvasive therapies may be sufficient for others. The predominant surgical method employed to treat cysts is microsurgical fenestration, which involves the precise creation of an opening in the cyst wall to allow for the drainage of fluid into the subarachnoid space. This intervention possesses the capacity to mitigate the strain on the spinal cord and nerve roots, hence augmenting the appearance of symptoms.[3] Previous research has established that most surgical procedures for cystic dilation of the VT involve the formation of an aperture in the cyst. However, only a few studies have reported on the use of shunt surgery to connect the cyst to the subarachnoid space. It is hypothesized that shunt surgery is effective in reducing the likelihood of further cyst development.[3]

Despite significant advancements in spinal cord architecture and neurology, there is still a noticeable gap in our overall understanding of the VT. There is a lack of cohesion in the existing literature, which is primarily comprised of case reports.[1-6] Through a thorough examination of the available studies, the primary objective of this literature review is to offer a comprehensive comprehension of the anatomical variability, diagnostic methods, symptomatic manifestations, and diverse surgical techniques employed in individuals with VT.

METHODS

A comprehensive review of the existing literature was undertaken to identify studies that met the eligibility criteria. We searched PubMed, Scopus, and Google Scholar for all articles evaluating signs, diagnoses, and treatments of VT from 1990 to January 2023. The terms "Ventriculus terminalis," "terminal ventricle," and "5th ventricle" were used in the search. Articles that describe the diagnosis of a ventriculus and its treatment, research articles written in English, studies conducted on human subjects, and studies that made the full text of their research available were all considered for inclusion. Non-English articles, editorials, letters, abstracts, and studies based solely on genetic analysis or imaging were not included. Studies were initially screened for eligibility by reviewing their titles and abstracts against the predetermined criteria. After determining which articles met the requirements, we read them in their entirety and evaluated them thoroughly. The extracted data from the studies encompassed several variables, such as the author's name, publication year, as well as demographic information including age, gender, presenting symptoms, follow-up time, and patient outcomes.

RESULTS

In total, 290 articles were found after an initial search of the PubMed, Scopus, and Google Scholar databases. In total, 34 studies[3-5,8-36] met the inclusion criteria after being screened for quality via titles, abstracts, and full texts. The present study involved the analysis of patient-level data from a cohort of 90 individuals presenting with ventricularis terminalis.

The average age of the patients in the study was 39 years, with 13 individuals identified as male, accounting for 14.4% of the total sample. Table 1 presents an overview of patient characteristics, encompassing their initial symptoms and the duration of these symptoms. Table 2 presents a comprehensive overview of the MRI results obtained from each individual subject. Table 3 presents a detailed overview

Table 1: Clinical characteristics in patients with ventriculus terminalis

Author/year	Age	Gender	Low back pain	Sciatica	Gait disturbances	Motoric deficits	Sensory deficits	Bowel disturbance	Bladder disturbance	Duration of symptoms (months)
Fletcher-Sandersjöö *et al*., 2019[3]	63	Female	No	No	Yes	Left sided leg weakness	No	Yes	No	9
	50	Female	No	Yes	Yes	Bilateral leg weakness	Yes	Yes	No	24
	36	Female	Yes	No	No	No	No	No	No	120
	45	Female	No	Yes	Yes	Bilateral leg weakness	Yes	Yes	No	30
	38	Female	No	Yes	No	No	No	No	Yes	24
	44	Female	No	No	Yes	Bilateral leg weakness	Yes	No	Yes	12
	42	Female	No	No	No	No	Yes	No	No	12
	53	Female	No	Yes	Yes	Right-sided leg weakness	No	No	No	18
	71	Male	No	No	No	Bilateral leg weakness	No	No	Yes	18
	64	Female	Yes	No	Yes	Bilateral leg weakness	Yes	Yes	Yes	60
	40	Female	No	Yes	No	No	No	No	No	60
	35	Female	No	Yes	Yes	Bilateral leg weakness	No	No	No	30
	56	Female	No	Yes	Yes	Right-sided leg weakness	No	No	No	24
	38	Female	No	Yes	No	No	No	No	No	12
Ganau *et al*., 2012[9]	13 cases: Average 52	Female/ male: 4:1	10 cases	10 cases	11 cases	7 cases (bilateral leg weakness)	10 cases	3 cases	3 cases	Average: 24
Suh *et al*., 2012[10]	45	Female	No	No	No	No	No	No	No	0
	33	Male	No	No	No	No	No	Yes	No	Unknown
	51	Female	No	No	No	No	Yes	No	No	Unknown
	43	Male	No	Yes	No	No	No	No	No	Unknown
	45	Male	No	No	No	No	No	No	No	Unknown
	50	Male	Yes	No	No	No	No	No	No	Unknown
	44	Female	No	No	No	No	No	Yes	No	Unknown
	51	Male	No	No	No	No	No	Yes	No	Unknown
	59	Male	No	No	No	No	No	No	No	Unknown
	44	Male	No	No	No	No	No	No	No	Unknown
Sigal *et al*., 1991[11]	4 cases: Average 49	All female	Yes	Yes	No	No	No	No	Yes	Unknown
Dhillon *et al*., 2010[24]	40	Male	No	No	Yes	Right leg weakness	Yes	No	No	48
de Moura *et al*., 2008[23]	43	Female	Yes	Yes	No	No	Yes	Yes	Yes	24
	27	Female	No	Yes	No	No	No	Yes	Yes	8
Ciappetta *et al*., 2008[35]	78	Male	No	Yes	No	Bilateral leg weakness	No	No	No	36
	82	Female	Yes	Yes	Yes	Bilateral leg weakness	No	Yes	Yes	6
Matsubayashi *et al*., 1998[27]	49	Female	Yes	Yes	No	Yes	No	No	Yes	Unknown
	58	Female	Yes	Yes	No	Yes	No	No	Yes	Unknown
Woodley-Cook *et al*., 2016[30]	47	Female	No	No	No	Bilateral leg weakness	Yes	No	No	24
Severino and Severino, 2017[25]	52	Female	No	No	No	Right-sided leg weakness	Yes	No	No	18
Truong *et al*., 1998[26]	Newborn	Male	No	No	No	No	No	No	No	Unknown
Dullerud *et al*., 2003[19]	47	Female	No	No	Unknown	No	Unknown	Unknown	Unknown	6
	42	Female	Yes	Yes	No	No	No	No	No	24
Kawanishi *et al*., 2016[17]	66	Female	No	No	Yes	Bilateral leg weakness	Yes	No	No	24

Contd...

Table 1: Contd...

Author/year	Age	Gender	Low back pain	Sciatica	Gait disturbances	Motoric deficits	Sensory deficits	Bowel disturbance	Bladder disturbance	Duration of symptoms (months)
Brisman *et al*., 2006[28]	57	Female	No	Yes	Yes	Bilateral leg weakness	Yes	Yes	Yes	36–48
Zeinali *et al*., 2019[29]	5	Male	No	No	Yes	No	No	Yes	Yes	1
Bellocchi *et al*., 2013[20]	61	Female	Yes	No	Yes	No	No	No	No	12
Menezes *et al*., 2023[1]	1	Female	No	No	No	No	No	No	No	12
Tuleasca *et al*., 2021[22]	70	Female	No	No	No	Bilateral leg weakness	No	No	No	Unknown
	55	Female	No	Yes	No	Left-sided leg weakness	No	No	No	Unknown
	57	Female	No	No	No	Bilateral leg weakness	No	No	No	36
Domingo *et al*., 2020[36]	54	Female	No	No	Yes	Left-sided leg weakness	Yes	No	Yes	3
Weisbrod *et al*., 2021[33]	57	Female	No	No	No	Right-sided leg weakness	Yes	No	No	6
Shigekawa *et al*., 2023[5]	78	Female	Yes	No	No	No	Yes	No	No	Unknown
	62	Female	No	No	No	No	No	No	No	36
	67	Female	No	No	No	No	No	No	No	Unknown
Tancioni *et al*., 2007[31]	37	Female	Yes	No	No	No	No	No	No	Unknown
Núñez Báez *et al*., 2022[7]	30	Female	No	No	Yes	No	Yes	No	No	1
Baig Mirza *et al*., 2021[13]	25	Female	Yes	No	No	Bilateral leg weakness	Yes	No	No	1
Van Rillaer *et al*., 2009[16]	42	Female	No	No	No	No	No	No	No	Unknown
Takahashi *et al*., 2009[32]	26	Female	No	No	Yes	Bilateral leg weakness	Yes	No	No	48
	64	Female	Yes	No	Yes	Bilateral leg weakness	Yes	No	No	14
	66	Female	Yes	No	Yes	Bilateral leg weakness	Yes	No	Yes	8
	69	Female	No	No	Yes	Bilateral leg weakness	Yes	No	Yes	18
Celli *et al*., 2002[21]	42	Female	No	No	No	No	No	No	Yes	Unknown
Muto and Palmieri, 2000[8]	59	Female	Yes	No	No	No	No	Yes	Yes	24
	65	Female	Yes	No	No	No	No	Yes	Yes	24
Sansur *et al*., 2006[15]	47	Female	Yes	No	No	No	Yes	No	Yes	6
Zhang, 2017[34]	1	-	No	No	No	No	No	No	No	0
Poe, 2008[18]	47	Male	No	No	No	No	No	No	No	0
Senoglu, 2009[14]	6	Female	No	No	No	No	No	No	No	0
Lotfinia and Mahdkhah, 2018[4]	62	Female	Yes	No	No	No	No	No	No	6
	64	Female	Yes	No	Yes	Bilateral leg weakness	Yes	No	No	24
	51	Female	Yes	No	No	No	Yes	No	No	24
Zhang *et al*., 2017[34]	54	Female	Yes	Yes	Yes	Bilateral leg weakness	Yes	No	No	30
	54	Female	No	Yes	No	No	No	Yes	Yes	10
	56	Female	No	No	Yes	No	Yes	No	No	2
	27	Female	Yes	Yes	No	No	No	No	No	8
	46	Female	Yes	Yes	No	Bilateral leg weakness	No	No	No	2
	27	Female	No	No	Yes	No	Yes	No	No	6

Table 2: Imaging characteristics in patients with ventriculus terminalis

Study	Preoperative MRI	Spinal segment	Cyst size/ diameter (mL)	Other abnormalities (tethered cord, dysraphism, lipoma)
Fletcher-Sanders (2019)	Yes	T11-12	12	No
	Yes	T11-12	2	No
	Yes	T11-12	2	No
	Yes	T12-L1	0.4	Herniated disc at L5/S1
	Yes	T12-L1	2	Herniated disc at L5/S1
	Yes	T12-L1	9	Disk degeneration at L4-S1
	Yes	T12-L1	1	No
	Yes	T12-L1	1	Herniated disc at C4/5, spinal stenosis at C5/6
	Yes	T12-L1	5	
	Yes	L2-S2	23	No
	Yes	T12-L1	3	Spinal stenosis at C5/6, synovial cyst at S3/4
	Yes	T11-12	1	Disk degeneration at L4-S1
	Yes	T12-L1	4	Herniated disc at L5/S1
	Yes	T12-L1	1.5	Disk degeneration at L4/5
				No
Ganua (2012)	Yes	T12-L1	Unknown	3 cases with degenerative spinal disorders
Suh (2012)	Yes	T12	15	No
	Yes	T12	25	No
	Yes	T11	68	No
	Yes	T11	24	No
	Yes	T12	30	Syringomyelia
	Yes	T11	25	Kyphotic deformity
	Yes	T12	60	No
	Yes	T12	33	No
	Yes	T12	18	Spinal arteriovenous malformation
	Yes	T12	15	No
Sigal (1991)	Yes	T11-L1	Average 32×31	1 case: Chiari malformation type I
Dhillon (2010)	Yes	T11-12	20×40	No
Batista (2008)	Yes	T12-L1	12×13×17	Herniated disc at L5-S1
	Yes	T12-L1	14×12×17	Disc degenration at L4-S1
Ciappetta (2008)	Yes	T12-L1	Unknown	No
	Yes	T12-L1	55	No
Matsubayashi (1998)	Yes	T11-L1	50×20	No
	Yes	T11-L1	40×20	Intradural extramedullary lipoma
Woodley-cook (2016)	Yes	T12-L1	Unknown	No
Severino (2017)	Yes	T10-12	6.4×7.9	No
Truong (1998)	Yes	L3-4	12×6 × 8	Partial sacral agenesis, filum lipoma
Dullerud (2003)	Yes	T10-12	18×26×40	No
	Yes	T11-12	19×21×45	No
Kawanishi (2016)	Yes	T12-L1	Unknown	No
Brisman (2006)	Yes	T11-L1	Unknown	No
Zeinali (2007)	Yes	T12-L1	20	Hemivertebrae L5
Bellocchi (2013)	Yes	T11-L1	60×13	No
Menezes (2023)	Yes	L3-4	12×5 × 5	Fibrolipoma of filum terminate
Tuleasca (2020)	Yes	T11-L1	Unknown	No
	Yes	Unknown	Unknown	No
	Yes	Unknown	Unknown	No
Domingo (2020)	Yes	T10-11	Unknown	No
Weisbroad (2021)	Yes	T11-12	Unknown	No
Shigekawa (2023)	Yes	T12-L1	Unknown	No
	Yes	Unknown	Unknown	No
	Yes	Unknown	Unknown	No

Contd...

Table 2: Contd...

Study	Preoperative MRI	Spinal segment	Cyst size/ diameter (mL)	Other abnormalities (tethered cord, dysraphism, lipoma)
Tancioni (2007)	Yes	Unknown	19×13	No
Baez (2022)	Yes	T11-12	Unknown	No
Mirza (2021)	Yes	Unknown	Unknown	No
Rillaer (2009)	Yes	T12-L1	20×18	No
Takahashi (2009)	Yes	Unknown	Unknown	No
	Yes	Unknown	Unknown	No
	Yes	Unknown	Unknown	No
	Yes	Unknown	Unknown	No
Celli (2002)	Yes	Unknown	Unknown	No
Muto (2000)	Yes	Unknown	Unknown	Spinal stenosis at L1/2
	Yes	Unknown	Unknown	No
Sansur (2006)	Yes	Unknown	Unknown	No
Siegel (2000)	Yes	T12-L1	Unknown	No
Poe (2008)	Yes	Unknown	Unknown	No
Senoglu (2009)	Yes	Unknown	Unknown	No
Lotfinia (2018)	Yes	Unknown	Unknown	No
	Yes	Unknown	Unknown	No
	Yes	Unknown	Unknown	No
Zhang (2017)	Yes	Unknown	25×10×14	Herniated disc at L5/S1
	Yes	T12-L1	70×13×13	No
	Yes	T12-L1	36×14×11	No
	Yes	T12-L1	10×6 × 6	No
	Yes	T12-L1	37×13×15	No
	Yes	T12-L1	25×19×12	No

MRI - Magnetic resonance imaging

of the treatment administered to each patient, as well as their postoperative condition. Furthermore, pertinent details regarding the duration of follow-up and the current state of patients are available.

According to the data provided in Table 1, it can be observed that a total of 34 patients, accounting for 37.7% of the sample, reported low back pain as their presenting complaint. In addition, 34 patients, representing 37.7% of the sample, indicated sciatica as their presenting complaint. Out of the total sample size, 35 patients (38.8%) exhibited gait problems, while motoric deficits were observed in 38 patients (42.2%). Out of the whole sample size, 18 patients (20%) experienced bowel disturbance, whereas 23 patients (25.5%) reported bladder disturbance. Several patients presented with both sensory impairments and motor difficulties. The duration of symptoms showed variability among all subjects.

Based on the patient-level data provided in Table 2, it can be observed that preoperative MRI was conducted for all the patients. The analysis of spinal segments indicates that the lower thoracic and lumbar segments have the highest incidence of involvement. There was a singular instance in which the sacral spinal segments were further implicated. The size or diameter of cysts shows variability among the patients. Additional abnormalities found in patients with VT include instances of a herniated disc and disk degeneration. Instances of lipomas and spinal stenosis were observed. A single patient was diagnosed with syringomyelia.

The data shown in Table 3 illustrates the results and follow-up of patients, revealing that cyst fenestration was performed on 48 individuals, accounting for 53.3% of the whole sample, while myelotomy was conducted on 25 patients, representing 27.7% of the cohort. Percutaneous aspiration was performed on four patients, accounting for 4.4% of the whole sample. In addition, cysto-arachnoid shunt placement was conducted on 27 patients, representing 30% of the overall cohort. The size of postoperative cysts was observed to decrease in 58 individuals, accounting for 64.4% of the total sample. Among these cases, three patients necessitated additional surgery due to cyst recurrence, while one patient experienced motor impairment following the surgical procedure. There were no additional complications observed in patients following surgical intervention. The extent of follow-up information among patients exhibits variability. In the study, a significant proportion of patients, specifically 64 instances (51.1%), saw a notable amelioration of their symptoms. Conversely, a minimal number of cases, specifically three (3.3%), reported a deterioration in their symptoms.

Table 3: Treatment, outcome and follow-up in patients with ventriculus terminalis

Study	Conservative treatment	Fenestration	Myelotomy	Percutan aspiration	Cysto-arachnoid shunt	Postoperative cyst size	Postoperative complication	State at discharge	Status at last follow-up	Follow-up (months)
Fletcher-Sanders (2019)	No	Yes	No	No	No	Reduced	Resurgery by recurrence	Improved	Improved	103
	No	Yes	No	No	Yes	Reduced	No	Improved	Improved	16
	No	Yes	No	No	No	Reduced	No	Improved	Improved	85
	No	Yes	No	No	No	Reduced	No	Improved	Improved	60
	No	Yes	No	No	No	Reduced	No	Improved	Improved	61
	No	Yes	No	No	No	Reduced	Resurgery by recurrence	Improved	Improved	99
	No	Yes	No	No	No	Reduced	Resurgery by recurrence	No change	No change	90
	No	Yes	No	No	No	Reduced	No	Improved	Improved	96
	No	Yes	No	No	No	Reduced	No	Improved	Improved	59
	No	Yes	No	No	No	Reduced	No	Improved	Improved	155
	No	Yes	No	No	Yes	Reduced	No	No change	No change	7
	No	Yes	No	No	No	Reduced	No	Improved	Improved	11
	No	Yes	No	No	No	Reduced	No	Improved	Improved	16
	Yes	No	No	No	No	Unknown	No	No change	Deteriorated	124
Ganua (2012)	3 cases	10 cases	10 cases of 13	No	10 cases	Reduced in13 cases	No	Improved	Improved	61
Suh (2012)	6 patients were not treated because there was no change in their clinical symptoms					Unknown	No	No change	No change	20
						Unknown	No	Improved	Improved	8
						Unknown	No	Unknown	Unknown	13
						Unknown	No	No change	No change	12
						Unknown	No	No change	No change	12
						Unknown	No	No change	No change	13
						Unknown	No	No change	No change	14
						Unknown	No	Improved	Improved	60
						Unknown	No	Improved	Improved	48
						Unknown	No	No change	No change	13
Sigal (1991)	2 cases	2 cases	No	No	No	No change	No	Unknown	Unknown	Unknown
Dhillon (2010)	No	Yes	No	No	Yes	Reduced	No	Improved	Improved	15
Batista (2008)	No	No	Yes	No	No	Reduced	No	Improved	Improved	22
	No	No	Yes	No	No	Reduced	No	Improved	Improved	17
Ciappetta (2008)	No	Yes	No	No	No	Reduced	No	Improved	Improved	12
	No	Yes	No	No	No	Reduced	No	Improved	Improved	12
Matsubayashi (1998)	No	Yes	No	No	No	Unknown	No	Improved	Unknown	Unknown
	No	Yes	No	No	No	Unknown	No	Improved	Unknown	Unknown
Woodley-cook (2016)	No	Yes	Yes	No	No	Unknown	No	Improved	Improved	1
Severino (2017)	No	No	Yes	No	No	Reduced	No	Improved	Improved	3
Truong (1998)	No	No	No	No	No	Unknown	No	Unknown	Unknown	Unknown
Dullerud (2003)	No	Yes	Yes	No	No	Reduced	Motor disturbance	Improved	Unknown	0
	No	Yes	Yes	No	No	Reduced	No	Improved	Deteriorated	30
Kawanishi (2016)	No	Yes	No	No	No	Reduced	No	Improved	Improved	36

Contd...

Table 3: Contd...

Study	Conservative treatment	Fenestration	Myelotomy	Percutan aspiration	Cysto-arachnoid shunt	Postoperative cyst size	Postoperative complication	State at discharge	Status at last follow-up	Follow-up (months)
Brisman (2006)	No	No	Yes	No	No	Reduced	No	Improved	Improved	3
Zeinali (2007)	No	Yes	Yes	No	No	Reduced	No	Improved	Improved	6
Bellocchi (2013)	No	Yes	Yes	No	No	Reduced	No	Improved	Improved	8
Menezes (2023)	No	No	No	No	Yes	Unknown	No	Improved	Improved	36
Tuleasca (2020)	No	No	No	No	No	Reduced	No	Improved	Unknown	Unknown
	No	No	No	No	No	Reduced	No	Improved	Improved	Unknown
	No	No	Yes	No	Yes	Reduced	No	Improved	Improved	Unknown
Domingo (2020)	No	Yes	Yes	No	No	Reduced	No	Improved	Improved	1,5
Weisbroad (2021)	No	Yes	No	No	No	Unknown	No	Unknown	Improved	1
Shigekawa (2023)	No	Yes	No	No	Yes	Reduced	No	Improved	Improved	36
	No	Yes	No	No	Yes	Reduced	No	Unknown	Improved	24
	No	Yes	No	No	Yes	Reduced	No	Improved	Improved	48
Tancioni (2007)	No	Yes	No	No	No	Reduced	No	Improved	Unknown	Unknown
Baez (2022)	No	Yes	Yes	No	Yes	Unknown	No	Improved	Unknown	Unknown
Mirza (2021)	No	No	No	No	No	Unknown	No	No change	Unknown	Unknown
Rillaer (2009)	No	No	No	No	No	Unknown	No	Unknown	Unknown	Unknown
Takahashi (2009)	No	Yes	No	Yes	No	Unknown	No	Improved	Improved	48
	No	No	No	Yes	No	Unknown	No	Improved	Improved	30
	No	No	No	Yes	No	Unknown	No	Improved	Improved	24
	No	No	No	Yes	No	Unknown	No	Improved	Improved	12
Celli (2002)	No	No	No	No	No	Unknown	No	Improved	Unknown	Unknown
Muto (2000)	No	No	No	No	Yes	Reduced	No	Unknown	Unknown	Unknown
	No	No	No	No	Yes	Reduced	No	Unknown	Unknown	Unknown
Sansur (2006)	No	Yes	No	No	No	Reduced	No	Improved	Improved	10
Siegel (2000)	No	No	No	No	No	Unknown	No	Unknown	Unknown	Unknown
Poe (2008)	No	No	No	No	No	Unknown	No	Unknown	Unknown	Unknown
Senoglu (2009)	No	No	No	No	No	Unknown	No	Unknown	Unknown	Unknown
Lotfinia (2018)	No	Yes	Yes	No	Yes	Reduced	No	Improved	Improved	28
	No	Yes	Yes	No	Yes	Reduced	No	Improved	Deteriorated	28
	No	Yes	Yes	No	Yes	Reduced	No	No change	No change	28
Zhang (2017)	No	No	No	No	Yes	Reduced	No	Improved	Improved	Mean 41
	No	No	No	No	Yes	Reduced	No	Improved	Improved	
	No	No	No	No	Yes	Reduced	No	Improved	Improved	
	No	No	No	No	Yes	Reduced	No	Improved	Improved	
	No	No	No	No	Yes	Reduced	No	Improved	Improved	
	No	No	No	No	Yes	Reduced	No	Improved	Improved	

DISCUSSION

This narrative study provides a comprehensive analysis of the clinical characteristics and demographic profiles of patients who have been diagnosed with VTs. The findings offer significant insights into the diverse clinical presentations and underlying etiologies associated with VT. The results suggest that individuals with VTs display a wide range of ages, including both newborns[1,26,37] and elderly individuals.[3,5,35] The observed mean ages in the several studies displayed diversity, which can be related to the varying frequency of the condition among different age groups. Several studies have shown a propensity for a greater number of females,[3,4,9,11,22,32,34] while others have indicated a virtually equal distribution of both genders.[35] The observed gap might be explained by differences in the sample populations used in each study or suggest the existence of gender-specific risk factors.

The duration of symptoms prior to the commencement of treatment demonstrated significant variability, including a wide range of time periods ranging from a few months to several years. The aforementioned diversity underscores the importance of prompt identification and treatment, as prolonged symptoms can lead to more nerve damage and worsened outcomes. A potential association might exist between a prolonged duration of symptoms and the manifestation of more significant neurological abnormalities.[38] It is crucial to promptly detect VTs, thoroughly assess first symptoms, and promptly intervene to minimize the potential for long-term neurological disabilities and enhance patient outcomes. The presence of a wide array of symptoms underscores the imperative of implementing a multidisciplinary approach that integrates the knowledge and skills of neurologists, neurosurgeons, and rehabilitation specialists to ensure comprehensive and effective therapy.

In addition, this study provides a comprehensive examination of the preoperative MRI results reported in patients who have been diagnosed with VTs. The present investigation examined the prevalence of various preoperative MRI abnormalities, the extent of spinal segment involvement, the dimensions of cysts, and associated abnormalities such as tethered cord, dysraphism, and lipoma.[3-5,8-36] The findings underscore the importance of preoperative MRI in understanding the characteristics of VTs and their potential impact on neighboring anatomical structures. There was considerable diversity seen in the distribution of cysts across different spinal segments. The segment spanning from T12 to L1 had the highest frequency of occurrence, followed by the T11-12 region. The existence of variability in the involvement of different segments suggests that VTs may have their origins throughout the whole spinal column.[39] Hence, it is imperative to do a thorough MRI assessment, regardless of the specific spinal level under consideration.[38] The dimensions of the cyst were also found as a significant criteria of relevance in this research. The investigation produced a wide range of cyst sizes, ranging from small (e.g., 0.4 mL)[3] to large (e.g., 70 mL).[34] The observed differences in size may suggest inequalities in the clinical presentation and potential impact on the adjacent spinal structures. The potential presence of bigger cysts may lead to more significant compressive effects and neurological complaints, hence requiring careful deliberation of treatment strategies.

In addition to evaluating cyst size and segment involvement, the preoperative MRI scans also revealed the presence of additional anomalies. It is noteworthy to add that there were some occurrences that exhibited concurrent abnormalities, such as herniated discs, disc degeneration, and kyphotic deformities.[3,9-11] These findings further emphasize the need of doing a thorough evaluation of the spinal column and its adjacent structures as part of preoperative assessments. The existence of these irregularities might potentially influence the course of clinical development and contribute to the decision-making process regarding treatment approaches. Consequently, it underscores the need to formulate comprehensive plans for patient care. Several notable cases have demonstrated the presence of concurrent diseases, including tethered cord, dysraphism, and lipoma.[1,26,27] The aforementioned factors can exert a significant impact on the approach to surgical intervention and the following results throughout the postoperative period. Therefore, it is imperative to do a thorough preoperative examination to accurately determine the extent of these defects and develop appropriate surgical strategies.

The analysis of treatment approaches reveals that a considerable fraction of patients had surgical interventions, including fenestration, myelotomy, and percutaneous aspiration. The frequency of conservative therapy was rather limited, indicating that surgical intervention is frequently required for cases of heightened complexity. According to the cited source, individuals who exhibited no symptoms or very mild symptoms were shown to be more inclined to derive advantages from conservative therapy. Conversely, patients who were encountering escalating neurological impairments or substantial discomfort were advised to contemplate surgical intervention.[39] The selection of the optimal treatment strategy is influenced by several aspects, such as the dimensions and placement of the cyst, along with any associated symptoms. The clinical practice guideline established by the Congress of Neurological Surgeons aligns with the aforementioned remark.[40] The research investigation revealed that the use of various treatment modalities led to a decrease in the size of cysts following surgical intervention. This finding suggests that surgical procedures have the potential to effectively alleviate symptoms related to cysts through the decompression of the affected spinal segments. Furthermore, it is noteworthy that cysto-arachnoid shunting shown a propensity for reducing postoperative cyst diameters in a majority of cases, thereby underscoring its potential as a feasible therapeutic strategy. However, there were certain occurrences that demonstrated a recurrence and required further surgical procedures, thereby highlighting the importance of continuous monitoring and ongoing evaluation of patients.

While the majority of treatment results were generally positive,[3,34] a small subset of individuals did have postoperative complications. The range of motor anomalies and declining conditions were reported.[4,19] The presence of adverse events underscores the significance of conducting comprehensive assessments of treatment options and their corresponding risks, especially when determining the appropriateness of surgical interventions.

Patient-specific characteristics, such as the cyst's location, size, and the existence of associated abnormalities, may contribute to the variety of outcomes and challenges encountered. The analysis of patients' states upon discharge and their statuses during the last follow-up period revealed an overall improvement in a significant number of cases. However, a number of occurrences shown no noticeable change or perhaps a decrease with time. The duration of the postintervention monitoring period varied throughout the trials, which might have influenced the observed results. It is crucial to recognize that evaluating the long-term effectiveness of therapies requires including extended durations of follow-up to fully understand their impact on patients' overall welfare.

Limitations

The limitations of this comprehensive analysis must be acknowledged and addressed as well. This review focused solely on the inclusion of case reports or case series.[3-5,8-36] The research included in the study shown heterogeneity in terms of sample numbers, methodology, and reporting standards. The presence of variability in the data has the potential to generate bias, which in turn might affect the generalizability of the conclusions. In addition, the heterogeneity in the durations of follow-up may have had an impact on the assessment of the treatment's long-term efficacy.

CONCLUSIONS

This review investigated the clinical attributes, symptoms, and demographic profiles of individuals diagnosed with VT. The findings indicated that individuals of various age groups and genders exhibited a diverse array of symptoms, encompassing motor and sensory impairments, challenges with walking, and experiences of pain. The aforementioned findings underscore the intricate nature and diverse manifestations of VTs, underscoring the significance of timely identification and the implementation of interdisciplinary therapeutic approaches. The acquisition of this data is crucial in the development of individualized treatment approaches and the enhancement of surgical results. The findings indicate that a range of surgical techniques can effectively decrease the size of cysts and enhance the overall outcomes for patients. However, there is a need for further research designs that adhere to standardized reporting protocols to enhance our understanding of this condition and provide more effective treatments that yield superior outcomes for patients.

Author contributions

All authors have contributed equally in all steps of manuscript preparation.

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Conflicts of interest

There are no conflicts of interest.

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