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Chronic subdural haematoma: a retrospective 232 cases review - a comparison of a single centre between a population aged under 75 and above 75 years old

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Abstract: Chronic subdural haematoma represents a major problem in the neurosurgical field concerning population both under and above 75 years old. It is not only a matter of prevalence or pure statistics but it embodies true understanding of how the pathology affects older patients, their life expectancy and quality when reliable factors are implied such as comorbidities, relation with the moment of surgery, the existence of anticoagulation therapy, and many more. We target these challenges in a study on 232 cases of treated chronic subdural haematomas with impact on two major categories - those under and above 75 years old in the Neurosurgery Department, County Hospital "Pius Branzeu" Timisoara, Romania.

Key words: antithrombotics, chronic subdural haematoma, midline shift, older population

Introduction

At the basis of chronic subdural haematoma (CSH) formation stands multiple aetiologies, such as trauma and acute subdural haematoma(aSH), spontaneous reasons including hydrocephalus, coagulopathies and chronic anticoagulation therapy, and iatrogenous causes such as a complication of a lumbar puncture (LP).

Among the risk factors involved are: predisposing of trauma, alcohol consumption, epilepsy, hemorrhage, and other predisposing factors such as coagulopathy, antithrombotics, high blood pressure, brain atrophy, hygroma [2,7,13,22,24] and others.

Clinical features include: motor deficiency, altering of consciousness, intracranial hypertension (ICH) syndrome, pseudotumoral, pseudodementia syndromes, headaches, and progressive speech impairment [11].

Differential diagnostics comprise of the following; stroke, dementia, encephalitis, cerebral abscess, tumor, and cerebral parasitosis as showed by standard imagistic

studies from CT (gold standard) and MRI [26,35].

The treatment options for CSH are for symptomatic cases, midline shift(MLS) with a minimum of 5 mm, mass effect, etc., also, conservative treatment stands for neurologically intact elderly patients on antithrombotics - withdrawal of antithrombotic medication 7 days prior to the surgery - in the case of eligibility for an operation, perioperative antibiotherapy prophylaxis [5,14,16,17,19,21,33].

In respect of the well-established techniques used for CSH evacuation these include; single "burr-hole" or double "burr-hole" technique + drainage, craniotomy +/- cranioplasty + drainage, subdural evacuating port system (SEPS), twist drill craniotomy [23], and endoscopy [10,20,27,30,34].

In the matter of complications and prognostics, the surgical intervention may be grafted by complications such as; haematoma persistency, pressure pneumocephalus, subdural empyema, convulsions, intracerebral hemorrhage, and others [8,35].

Recurrence of CSH can be early - less than 3 months postoperative or late - more than 3 months postoperative [3].

Postoperative midline-shift over 5 mm, diabetes, preoperative convulsions, over 20 mm in size of the haematoma, intracranian (IC) hypotension, low Glasgow Coma Scale(GCS), mixed density of the haematoma on the CT-scan, antithrombotic therapy, cancer and male population are associated with a higher risk of recurrence [19,29,32].

Aim of the study

To assess the results of a retrospective comparative study of 232 aged-related subjects over and under 75 years old with CSH treated in the Neurosurgery Dep. Timisoara County Hospital between 1st of January 2013 and 30th of September 2017.

Materials and methods

A total of 232 enrolled patients diagnosed with CSH from which 181 were male and 51 were female. Age over 75 yrs.; 70 M and 25 F; under 75 yrs.; 111 M and 26 F. Age-related < 75 yrs. old: 0-10 yrs., 9; 11-20 yrs., 2; 21-30 yrs., 1; 31-40 yrs., 2; 41-50 yrs., 17; 51-60 yrs., 28 61-74 yrs., 78. Age-related >75 yrs. old: 75-80 yrs., 53; 81-85 yrs., 31; 86-90 yrs., 9; 91-95 yrs.:2, comprising a single-centre study of the Department of Neurosurgery County Hospital "Pius Branzeu" Timisoara, Romania.

Chi Square Test was utilized to predict a statistically significant importance of several findings in the study.

	Total of patients	Patients over 75 yrs.	Patients under 75 yrs.
Total	232	95	137
Male	181	70	111
Female	51	25	26
Rural	78	28	50
Urban	154	67	87

Figure 1 - Sexes and prevalence of patients in respect to cohort

Age	Number of patients
0-10	9
11-20	2
21-30	1
31-40	2
41-50	17
51-60	28
61-74	78

Figure 2 - Age-related No. of patients enrolled under 75 years old

Regarding the data offered by the study, it shows that the incidence of CSH increases with lower ages in the population studied over 75 years old as follows: between 75-80 years old there were 53 patients included; between 81-85 years old, 31 patients; between 86-90 years old, 9 patients and from 91-95 years old, 2 patients.

Age	Number of patients
75-80	53
81-85	31
86-90	9
91-95	2

Figure 3 - Age-related No. of patients enrolled above 75 years old

Overall, fewer people in the segment considering the older than 75 years cohort spent between 1 and 3 weeks in hospital in comparison to the other studied cohort. Less than 1 week in hospital includes 26 patients vs. 34 in the same 2 groups; between 1-2 weeks it was 57 vs. 73 patients, and over 3 weeks in hospital there were 7 vs. 8 patients in total.

Time of hospitalization	Patients over 75	Patients under 75
Less than 1 week	26	34
1-2 weeks	57	73
2-3 weeks	5	22
Over 3 weeks	7	8

Figure 4 - Cohorts in relation to hospitalization

In addition, they were 44 compared to 74 people with left-side CSH in the 2 groups, 37 vs. 40 people with right-side CSH and 14 vs. 23 having bilateral haematomas.

Type of CSH	Patients over 75	Patients under 75
Left	44	74
Right	37	40
Bilateral	14	23

Figure 5 - Cohorts in relation with localization of the CSH

Midline shift is another landmark of the study that shows the following: 61 vs. 83 patients did not have any midline shift; 6 vs.10 patients had 1-5 mm deviation; 15 patients in both groups had MLS between 6-10 mm; and 9 vs.18 had a deviation between 11-15 mm and 4 vs.11 patients had MLS over 15 mm.

MLS (Midline-shift)	Patients over 75	Patients under 75
0 mm	61	83
1-5 mm	6	10
6-10 mm	15	15
11-15 mm	9	18
over 15 mm	4	11

Figure 6 - Cohorts in relation with MLS

GCS at presentation was recorded for all the patients included in the study: GCS 3p was seen in 2 vs. 4 patients in the 2 groups studied; GCS 4p, 2 vs. 1 patient; GCS 5p, each group had 1 patient; GCS6p, none of the 2 groups; GCS 7p, 1 vs. 2; GCS 8p, 5 vs. 3; GCS 9p, 4 vs. 3; GCS 10p, 3 vs. 2; GCS 11p, 0 vs. 1; GCS 12p, 4 vs. 3; GCS 13p, 10 vs. 7; GCS 14p, 33 vs. 27; GCS 15p, 30 vs. 83 in the cohorts.

GCS at presentation	Patients over 75	Patients under 75
15	30	83
14	33	27
13	10	7
12	4	3
11	0	1
10	3	2
9	4	3
8	5	3
7	1	2
6	0	0
5	1	1
4	2	1
3	2	4

Figure 7 - Cohorts in correlation with GCS at presentation

Clinical features of the CSH were assessed as being part of the general findings in this study: One-side motor weakness in 61 vs. 73 cases; dysphasia in 31 vs. 37; headaches in 46 vs. 86;

Convulsions in 6 vs. 15 patients; paraparesis in 1 vs. 4; tetraparesis 1 vs. 0; Unilateral Babinski signs in 22 vs. 23 and bilateral Babinski signs in 12 vs. 7 patients from the over/under 75 groups.

Clinical features	Patients over 75	Patients under 75
Hemiparesis	61	73
Dysphasia	31	37
Headaches	46	86
Convulsions	6	15
Paraparesis	1	4
Tetraparesis	1	0
Unilateral Babinski	22	23
Bilateral Babinski	12	7

Figure 8 - The 2 groups in relation with clinical features

Imagistics	Patients over 75	Patients under 75
CT	91	105
MRI	4	16
Both	0	16

Figure 9 - Cohorts in relation to radiological modality of exploration

Associated haematoma	Patients over 75	Patients under 75
Extradural	3	3
Parenchymal	2	1

Figure 10 - Relationship between associated haematomas and age-related study groups

In the matter of imagistic data, we had 91 patients scanned with CT in the first group and 105 in the second one; 4 had taken an MRI scan in the first group vs. 16 in the second one, and both investigations were undergone by 16 of the patients in the second group.

Associated co-morbidity	Patients over 75	Patients under 75
Chronic renal failure	2	4
Heart failure	14	13
Stroke	11	15
Respiratory failure	12	9
Pneumonia	7	9
AFib	17	12
Ischaemic cardiopathy	27	18
Sepsis	4	4
Cancer	3	4
High blood pressure	53	62
Type 2 diabetes	14	24
COPD	1	5

Figure 11 - Associated co-morbidity factors in relation to the 2 populational groups

The associated morbidity and mortality factors in the assessment of CSH are amongst other important elements in the evaluation of age-related evolution of the pathology, therefore CRF (Chronic renal failure) was seen in 2 vs. 4; Heart failure in 14 vs. 13; Stroke in 11 vs. 15; Respiratory failure in 12 vs. 9; Pneumonia in 7 vs. 9; Afib in 17 vs. 12; Ischemic cardiopathy in 27 vs. 18; Sepsis in equal parts 4:4; Cancer in 3 vs. 4; High blood pressure in 53 vs. 62; Type II diabetes in 14 vs. 24 and COPD in 1 vs. 5 cases.

Basic antithrombotic therapy	Patients over 75	Patients under 75
Antiplatelet	10	9
Anticoagulants	21	13

Figure 12 - Use of antithrombotics in CSH regarding cohorts

Regarding the use of antithrombotics, in the first group of patients we found 10 vs. 9 in the second one who were on antiplatelet therapy and 21 over 75 years old vs. 13 under 75 years old who took anticoagulants.

	Patients over 75	Patients under 75
Median days of hospitalization from admission until surgery	2.30 days	2.99 days

Figure 13 - Time of hospitalization between admission and surgery

Therapy options	Patients over 75	Patients under 75
Surgery	85	124
"Burr-hole" craniectomy	0	2
Craniotomy	2	2
Minimal craniectomy	83	119
CSH kit SEPS	0	1
Conservative	10	13

Figure 14 - Therapy options in respect of the 2 groups

Figure 15 - 89 years old patient CT scan in axial plane showing left frontal-parietal CSH and a recent ischemic event localized left frontal-pole

Figure 16 - Axial CT scan of a 67 years old patient with a 13 cm AP length and a 2.5 cm thick left CSH and right midline shift

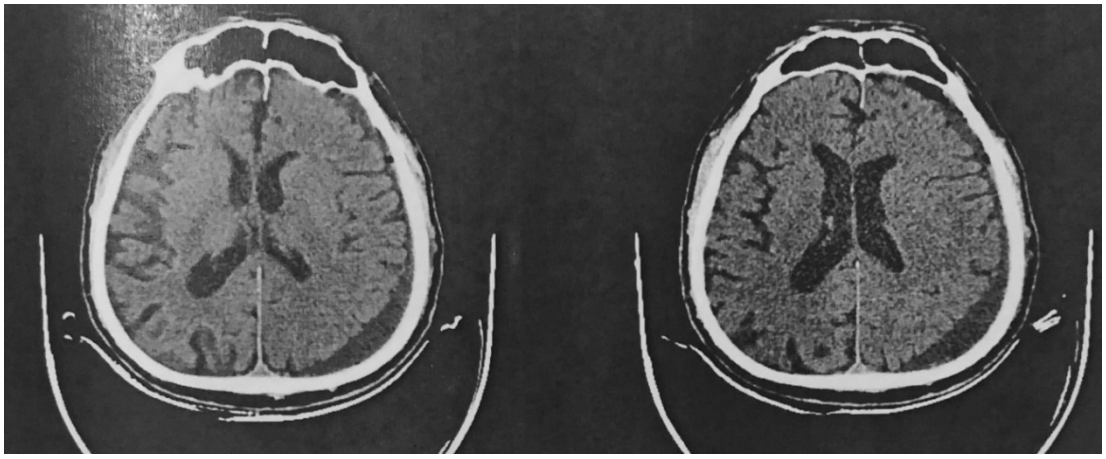

Figure 17 - A 61 years old patient, axial image showing left fronto-parieto-temporal chronic subdural haematoma

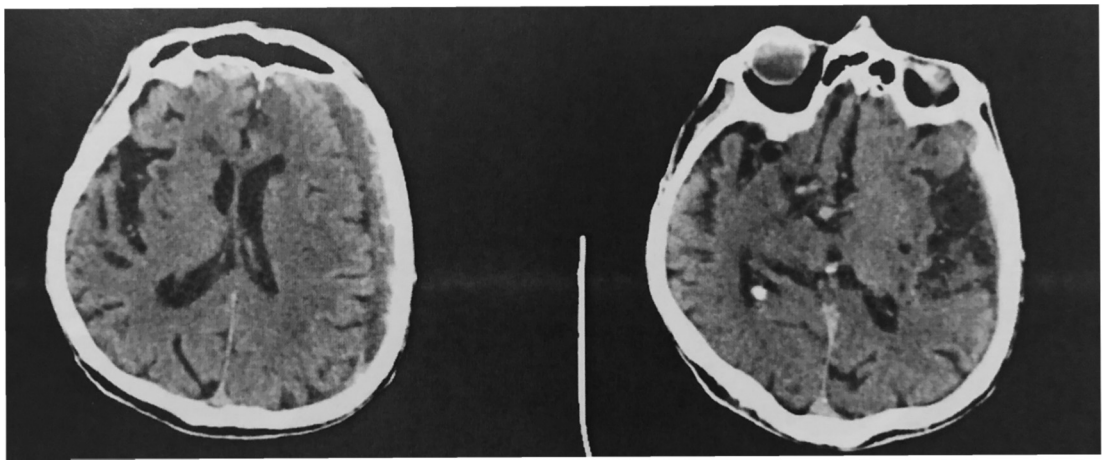

Figure 18 - A left isodense CSH with several arias of hypodensity showing re-bleeding phenomenon and a 26 mm thickness showing mass effect over the midline shift and almost complete imprinting of the left ventricle

Results

The study shows the mortality in patients older than 75 outnumber those under 75. The difference is statistically significant under the evaluation of the Chi Square Test (0.0001) thus the comatose patient number is higher in the cohort representing patients over 75 in comparison with the second group, this proved not to be statistically significant (Chi Square Score 0.125).

From the two groups, those over 75 were treated predominantly in a conservative fashion that meant 10.526% vs. 9.489%, also without importance in the study (value=0.725).

The number of those over 75 years old on antithrombotics is significantly higher than younger patients with the same treatment (Chi Square Test 0.007).

Bilateral chronic subdural haematomas (bCSH) were rarely observed in the over 75 years cohort vs. those under, (14.736% and 16.788%) but this also poses no statistical significance (Chi Square Test 0.943) evenly quoted by Song DH et al [28]

From the total number of patients, 54% from those under 75 years old, had left hemispheric CSH vs 29.1% showing right hemispheric involvement. In the second group regarding the patients over 75 years old, CSH was seen more frequently - 46.3% affecting the left side vs 38.9% in the right side.

In the matter of prevalence of the gender-dependent population, 81.1% of males and 18.9% females were under 75 years old in comparison to 73.6% of males and 26.3% females over 75 years also stated in between the values reported in the study by Oh J. et al.[24].

The improvement of deficits was more frequently found in the over 75 years old cohort (Chi Square Test 0.010).

The medium global hospitalization time was 10.48 days with a standard deviation of 7.233 days with a range from 1-49 days. In the over 75 year old group the study showed that a

total of 26 patients (25.86%) stayed under 1 week and 7 patients (6.47%) stayed for over 3 weeks. From that, those staying under 1 week comprised 27.37% and those staying over 3 weeks 7.37%, and in the cohort under 75 years old 24.82% under a week and 5.84% over 3 weeks.

The second group showed a medium hospitalization time of 10.36 days with a standard deviation of 6.803 days and in those over 75 years old 10.67 days with a 0.839 standard deviation.

Mortality was seen in 11.4% in the male population and 7.84% in the female population from the total of deaths. In our study, 33.3% were on antithrombotics either antiplatelet or anticoagulation treatment. 38.8% of the deaths registered in the over 75 years old cohort were on antithrombotics, but less than 16.6% was encountered in those under 75.

Clinical features	Total	Patients over 75 yrs old	Patients under 75 yrs old
Hemiparesis	57,758%	64%	53,284%
Afazia	29%	32,631%	27,007%
Headaches	56,896%	48,421%	62,773%
Epilepsy	9,051%	6,315%	10,948%
Babinsky sgn.	27,586%	35,789%	21,897%
Unilat.Babinsky	19,396%	23,157%	16,788%
Bilat.Babinsky	8,189%	12,631%	5,109%

Figure 20 - Outcomes in respect to the clinical features

The average value of MLS was 4.32 mm with a standard deviation of 5.772 mm. For the first study-group the average MLS was 4.68 mm (standard deviation 6.043 mm) and for the second group the study showed a MLS of 3.74 mm with a standard deviation of 5.290 mm. A value of 4.45 mm was showed for the patients who overcame the pathology with a median standard deviation of 5.797 mm and in those who died the prevalence translates to a 3.21 mm MLS with a median deviation of 5.548 mm, thus there were no significant differences in the two median values concerning the 2 study-groups.

GCS	Total	Patients over 75	Patients under 75
13-15	5.263%	9.589%	2.564%
9-12	30%	45.454%	11.111%
GCS=8	38%	60%	0%
GCS=6-7	0%	0%	0%
GCS=4-5	60%	66.666%	50%
GCS=3	33.333%	50%	25%

Figure 21 - Outcomes according to GCS in cohorts

The average value for GCS was 13.34 with a standard deviation of 2.823. For those under 75 years old, the average GCS was 13.66 with a standard deviation of 2.648 and for those over 75 years old the study showed a value of 12.83 and a mean deviation of 3.027. There is a significant difference regarding the value of GCS between those who survived and those who died.

From the conservative-treated patients all of them had an initial GCS of 14 or 15 with 3 exceptions: one patient under 75 with a GCS of 12; one patient over 75 years with a GCS of 3 and one patient over 75 years with a score of 4. Overall, neurological improvement was seen in 60% over 75 years old and respectively in 84.61% under 75. Without any improvement there were 30% in the first group and 15.38% in the second one.

In matter of mortality-CSH topography relationship, our study showed statistically higher rates of mortality for the over 75 years group vs. younger ages not only for unilateral CSH but also bilateral (Chi Square Test 0.01).

The evolution of the disease according to age group can be summarized as follows:

Average time of hospitalization from admission to surgery was: 2.264 days in the 75-80 years old subgroup; 1.580 days in the 81-85 years old subgroup and 1.727 days for those over 85 years old evaluated.

The average time of hospitalization was

10.118 days (+/- 7.913) for the 75-80 years old subgroup; 11.709 days (+/- 8.327) for the 81-85 years old subgroup and 69.909 days (+/- 6.786) for those over 85 years old.

There are no significant differences between the 3 subgroups regarding the average time of hospitalization.

As for the topography of the CSH in relation with antithrombotics the study found that the prevalence of those over 75 was higher (19.35%) in the anticoagulated group vs. 12.50% in those who did not benefit from the treatment and the same in the under 75 years old group where 22.72% had antithrombotics vs 15.65% without treatment.

Regarding the prevalence of comorbidity in the study, high blood pressure with a total percentage of 49.568% and in those over 75 years old - 55.789% and below 75 years old- 45.255%; followed by ischemic cardiopathy

showing a total of 19.396%, atrial fibrillation comes third in line, followed by stroke, diabetes and others.

Discussion

The study found —that under several aspects— significative differences concerning the evolution of a chronic subdural haematoma in the population under and over 75 years old. The haematomas are frequently encountered in the male population evenly under and over the age of 75, thus the total number of deaths are often seen in those over 75 no matter of gender or topography affected by the pathology.

The state of coma was attributed more to those over 75. The administration of antithrombotics was a direct factor of correlation for the apparition and recurrence of the haematoma and presented higher incidence rates of bilateral CSH with respect to Edlmann E et al. [9] and De Bonis P. et al. [7]. The elder patients seemed to have a lower rate of favorable neurological outcomes after the treatment opposite those of younger ages. The mortality is greater in the male population, and the study shows the appearance of motor deficits and aphasia were frequently seen in those under 75 years old in contrast with convulsions and the Babinski signs that predominate in those over 75 years old. Midline shift as a contributory factor of mortality was on all of its deviations and levels predominantly seen in the over 75 years group and less in those younger, and also independently of the GCS at admission with reference to Kim HC et al. [17]. There were no differences in the matter of mortality for those who had bilateral haematomas in respect of the general CSH prevalence.

Those treated conservatively from the group over 75 years old had a lower improvement percentage, higher mortality and stationary neurological outcome than the younger ages [35].

In a 2015 study, Aristedis Rovlias, Spyridon Theodoropoulos and Dimitrios Papoutsaki[26] reported a direct correlation between the CSH prognostic and the neurology status at admission, an aspect that is strengthened by this study observing the increasing mortality in parallel with a lower GCS, therefore at a GCS between 13-15, mortality was 5.26%, at a GCS of 9-12 the mortality was 30%, at GCS 8 and 4-5 mortality was 37.5% and 60% respectively.

Masaaki Uno et al. [31] focused in an article over the less favorable outcome of the CSH in patients over 75 years old vs. those under 75, as did this study that showed a higher mortality among those over 75 (18.9%) than in those under 75 (4.3%), and lower favorable outcomes for elderly patients (75.7%) vs younger ages (86.8%).

Antithrombotic usage represents an independent rise factor for the appearance of the CSH and it can also influence the prognosis [32,33,27]. In this study, 32.6% of those in the over 75 years old group had antithrombotics in comparison with 16% of those in the younger group.

In a study made by Agawa et al. [1], he reported a more unfavorable outcome for those with bilateral CSH, a fact that this study also confirmed, that mortality from bilateral CSH was significantly higher in patients over 75.

Regarding the surgical treatment of the CSH, Masaaki et al.[31] presented a favorable outcome for those treated by surgery of between 70-90%, also demonstrated by this study in terms of neurological improvement (83.2%), even if the prognostic worsened for those over 80 than under, this aspect determined the making of age-related subgroups and showed that in those over 85 the mortality reduced by half.

In-hospital related mortality in this study stands at the limits somewhere at 10.3% in comparison to Masaaki with reported limits between 0.21%-27.5%.

In a 2012 study on 125 patients made by Danilo Otavio de Araujo Silva et al. [6] with CSH, headaches showed in 40% of patients and deficits at 44%. This study percentage is nearby those values with 56.8% for the first one and 57.7% for the deficit.

I. A. Iliescu [11,12], in an article, correlates the higher incidence of the CSH in the male population, also demonstrated by this study. From the total of 232 patients,181 were male (78%) and only 51 were female (22%), and apparently the male gender is an independent negative factor for the CSH outcome, mortality being significative higher than in the female population (8.6% vs 1.7%). The same study reports a more right cerebral hemisphere dominance of the CSH (52%) and only 30% affecting the left side, therefore, in comparison this study found a more left-side prevalence of the CSH despite the 2 categories and last but not least between 2-19% of the patients had convulsions in the comparative study, in this study it was found that 9.05% of patients were affected which resemble the study of Battaglia et al.[4] who reports incidences of 10.6% and 14.9%.

Quiang-Ping Wang et al. [33] exemplified in a study that from their cohort of CSH-presenting patients, 20.5% had high blood pressure, 16.6% had heart failure and 13.9% had diabetes. In this study the findings were in the order 49.5%,11.6% and 16.3% thus high blood pressure and heart failure were found more often in those over 75 years old.

Borger V. et al. [5] randomized patients in 3 age-related groups as follows: 65-74 years; 75-84 years and 85-94 years. They concluded that postoperative although all the groups had increased improvement scores, they synchronized with age. Our study has similar results, therefore in those treated under 75 the percentage was 86.8% and declining to 75.7% in those over 75.

In this study, 3.01% of patients showed a positive diagnosis for cancer, higher for those over 75 years old and it correlates with the study of Yuji Agawa et al. [1] that stated an unfavorable prognostic for those affected by a tumor.

Conclusions

There are significant differences between the CSH outcome in the two study populations, therefore we consider that those differences should be taken into consideration for the in-hospital care of patients in order to maximize the prognostic.

Patients over 75 years old are posing a higher mortality rate than the younger ages. Coma is a complication of the slower rates of improvement, convulsions and deficits in the

group over 75 do not contraindicate surgery when imposed.

Those on antithrombotics showed an increased risk of developing bilateral CSH at higher ages and a more unfavorable outcome, a fact that is also predicted by the value of the MLS or the associated comorbidities, making the approach more complex.

The aging process will eventually lead to a higher incidence and prevalence of CSH in the population and can also stimulate the necessity of permanent care and evaluation of these kinds of patients.

There is a need for supplementary studies and opinions in order to establish a common point of optimum treatment of this vulnerable category of patients.

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